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ASTHMA.

T. MALLAINATHAN.





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# ASTHMA

A CURE WITHOUT DRUGS.

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BY

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Dedicated

to

ALL ASTHMATICS OF ALL CLIMES

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## FOREWORD.

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### I.

Dr. T. Nallainathan has requested me to write a foreword to a book, which he has written on the Ayurvedic treatment of Bronchial Asthma by the practice of certain Yogic breathing exercises.

Asthma is a most troublesome as well as a widespread ailment, as we all know. No satisfactory cure for it has yet been discovered.

Dr. Nallainathan deserves much credit for his enterprise as well as his research and industry in producing this interesting book amid the multifarious work which he is engaged in.

Both the West and the East have recognised the value of physical exercises in ensuring health.

Dr. Nallainathan states in his preface "We give the assurance of our remedy only for Bronchial Asthma; and this remedy is both a cure and a preventive."



If this object is achieved to any substantial degree by the methods set out by Dr. Nallainathan, he will have achieved an outstanding success in the medical world. Even if some alleviation is obtained by these methods, Dr. Nallainathan will receive the gratitude of many thousands of sufferers.

I have no doubt that this book will be welcomed by the public.

S. W. R. D. BANDARANAIKE,  
*Minister of Health and  
Local Government.*

Colombo, 12th Sept., 1950.

## FOREWORD.

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### II.

Asthma is perhaps one of the most dreadful diseases that man may ever be heir to. Its deleterious effect is greater than the other physical diseases because it is directly connected with the respiratory system.

Generally an asthmatic attack comes only to certain individuals in a family, and is the best example of a non-contagious disease. But heredity plays a great part in asthmatic conduction.

No earthly medicine seems to have any ultimate curative effect upon this dire disease and all the countless drugs of the physicians have been no more than temporary aids.

Perhaps the only remedy for an asthmatic attack is fast and rest. But undue weakness of the body is to be avoided. In eating, drinking, sleeping, walking, dressing, bathing, working and in every act the patient must be very very careful. As asthmatic attack is due very



much to a disturbance in the systematic working of the body. This is often caused by overwork to the digestive system.

It is found through practical experience, that Hatha Yogic exercises keep the body immune to asthma. It is a sad mistake, committed through rash anxiety and excitement, to repose full trust upon external drugs.

It is gratifying to note that Dr. Sri T. Nallainathan, Colombo, has made an extensive research on the subject of treatment of this disease and found that Yogic exercises are the effective means for a cure without drugs. This kind of therapy is best suited for the modern age and it will be a boon to all asthmatic patients.

SWAMI SIVANANDA.

Ananda Kutir,  
Himalayas,  
18th July, 1950.

## INTRODUCTION.

I have read with great interest Dr. T. Nallainathan's useful treatise entitled "Asthma—A Cure without Drugs." The author deserves the thanks of the medical profession and the public for placing before them an easy and practical method of dealing with the problem of asthma. The treatment of asthma has baffled many a practitioner, and asthma is responsible for untold suffering to many a patient. To them, Dr. Nallainathan's practical work will come as a solace and a hope.

The author is well qualified to write on the subject he has chosen. He has devoted many years to the study of this subject in the course of his twenty-two years' practice in the profession. He has made a close study of all the available literature on the subject both Eastern and Western. In this treatise he makes a comparative examination of the Western and Ayurvedic theories with regard to the cause of asthma and its treatment. Dr. Nallainathan is fully qualified to undertake this comparative study. He is a fully qualified Western Doctor and he has made a very close and sympathetic study of Ayurveda. Dr. Nallainathan has been connected with the College



of Indigenous Medicine for over twenty years. He is a most respected Senior Lecturer of the Institution. He is also the Senior-Obstetrician in the Hospital of Indigenous Medicine. His research work in the field of Ayurveda is commendable. In this volume, Dr. Nallainathan introduces a cure for Asthma by Yogic exercises. This method of treatment was known to Ayurveda as far back as 900 A.D. Of the four Special Exercises explained in this volume, three are of purely Ayurvedic origin and the fourth is a result of Dr. Nallainathan's researches. Physical exercise, as a method of treatment for Asthma, has been recognised by the Asthma Research Council, London, in 1927.

In this treatise, Dr. Nallainathan has made an effort to harmonise the Eastern and Western methods of treatment. I commend this book to the medical profession, both Western and Ayurvedic. I have no doubt that Dr. Nallainathan will receive the blessings of thousands of sufferers from the scourge of this fell disease for providing them with so simple and yet so effective a cure, as is suggested in the pages of this useful volume.

R. S. S. GUNewardene,

*Chairman,*

*The Board of Indigenous Medicine.*

Colombo, 15-8-50.

## PREFACE.

The number of asthmatics is legion, and yet how very few of them seem to realise that by simple natural means, without resort to medicines, asthma can be cured. The cure implies freedom from paroxysmal attacks. It is these attacks that keep the sufferer awake whole nights, and if our system of treatment, composed chiefly of a few special breathing exercises, assure a perfect night's repose without a break, it is certainly worthy of at least a fair trial.

The remedy is so simple that one can practise it while seated in the office chair, or in the car, or on the bed just before or after sleep. The cure consists primarily of a few breathing exercises. Patanjali, Svamarama and Thirumoolanayanar were the most stand-out men, who originally taught these to their disciples many centuries ago. They belong, technically, to the world of Yoga. Books on Ayurveda and Siddha contain ample references to and quotations from Yoga; and books on Yoga are replete with Ayurvedic and Siddha prescriptions. Therefore these exercises belong really to the realm of Ayurveda, which is another word for 'The Science of Life.' Unfortunately very few of the Ayurvedic practitioners seem to



know anything of these. It is really incumbent on them to study this sure remedy of theirs and give permanent relief to asthmatics.

If only these exercises, as given in the following pages, are taken there will not be even a trace of asthma. There will be neither the paroxysm nor the cough. Where the cough is caused by bronchitis, appropriate medical treatment should be taken for the same.

We give the assurance of our remedy only for Bronchial Asthma; and this remedy is both a cure and a preventive. Therefore normal people will also benefit by these exercises.

When asthma is in its early stages the very attempt at learning to practise this system of Pranayama prevents any further attacks. This is indeed literally true. But when it has become chronic a more steady application at these exercises is necessary. Where the patient has faith in our word or in our system the cure is quite an easy matter. We have had very chronic asthmatics, in whom the paroxysm often lasted some days. In one class of cases the party had faith in Yogic exercises and therefore learnt and practised our system without any further relapse. In the other class the party had faith in our word and therefore religiously learnt and practised our system without having further occasion to resort to medicines.

There is still another class of asthmatics who are prejudiced against or have a low estimation of the very names 'Ayurveda,' 'Yoga' and 'Pranayama.' They are quite sure in their own minds that exercises cannot possibly cure a disease and that a disease can be cured only by medicines. A succinct reply, which may appeal to them is as follows: 'Vigorous physical exercise increases the secretion of adrenalin (Halliburton). Stimulation of the central cut end of the vagus nerve, according to independent investigations of Chang, Huang and Wang, causes secretion of pituitary hormones. Our exercises, e.g., deep Ujjayi and the author's exercise in special, and to a less extent Uddiyana and Bhastrika, when done vigorously, are powerful enough to send such impulses through the vagus. Adrian has shown that the vagus conveys impulses in rapid succession each time the lungs are distended, the impulses being more numerous and in more rapid sequence the more powerful the distension. Our exercises, in common with all exercises, also stimulate the adrenal glands. The way in which Sirshasana stimulates pituitrin is fascinating and is discussed later. These two hormones, viz., pituitrin and adrenalin, which are given as injections by the doctor for asthma, are now shown to be produced by our Yogic exercises.' This subject is further discussed in Chapter XI, which deals with the modern medical aspects of asthma. It also shows clearly that our present medical treatment is more or less empirical and that it gives only temporary relief. It does not offer



a cure for asthma as it does for malaria. The utmost freedom from attacks is some months or perhaps some years. This, we say, is not enough. We give a system that bestows complete freedom from any further paroxysm for the rest of the life. These pages should cut asunder previously-formed ideas and create an openness of mind.

The time needed for these *Special Exercises* is small. The strenuous ones are depicted in the 3rd, 5th and 6th Chapters. Each of them requires only 3 minutes. When one is hard pressed for time the exercise 'Uddiyana' of the 6th Chapter may be omitted. Then only 6 minutes in the mornings are required for a sitting. The exercises in the 2nd and 4th Chapters can be done at any time anywhere. A summary of each exercise is given at the end of the chapter concerned.

It is fashionable today to say that allergy is the prime cause of Bronchial Asthma. We have discussed this in detail in Chapter XI and cited a case to show that there are factors superior to allergy and have shown that asthma is closely similar to epilepsy, that it is a functional disease and that it is caused principally by a sudden abnormal activity of the bronchomotor portion of the Vagus nucleus in the Medulla oblongata. The external protein in allergy, excites reflexly in an asthmatic, whose Vagus motor nucleus is irritable and unstable, a paroxysm, while in a normal individual it does not. Therefore allergy is not the root

cause; it is only one of a few exciting causes. The lowering of the tone of the sympathetic is also a cause.

Since it is functional we can control it. In our exercises we control the two vagus nuclei and nerves and through them the bronchial muscles and the bronchial mucous membrane. We also control the respiratory centres by the exercise of our will through the cerebral centres. Through the respiratory centres also we control the vagus nuclei.

If a Yogi can stop his respiration for 10 months (*vide* Chapter II, Page 43), he has full control over the respiratory and other vital centres. Without doubt such a man can control the Vagus Motor Centre. Therefore it behoves us to study their methods of approach to the cure of Asthma, and it is their exercises that we have given in these pages. These are modified to suit patients in the light of the latest researches. We have given detailed explanations for the mechanism of these exercises in terms of modern anatomy and physiology. Control of these nerve centres is not so difficult as a Western student may imagine. For example, we normally breathe at the rate of 20 times per minute. Within a short period of training we can bring down the rate to 5 times a minute and later 1 per minute. This signifies control.

At the start there will be cough rearing its head during the exercises. When the cough



brings up phlegm it is healthy and should be encouraged. This may distress the beginner ; a little patience is called for at this stage. The amount of phlegm will decrease gradually and when the cough does no more bring up phlegm an attempt should be made to stop it. Even if the attempt fails in the early stages it will certainly succeed later. Every attempt at stopping the cough should be considered a step towards success. The second easy exercise of the author given in Chapter V should be practised if the cough is troublesome.

We would state categorically that these exercises give the desired end, *viz.*, freedom from paroxysm and cough and these are not necessarily dependent or based on the theory of causation as given in Chapter XI. We have only given our view of the causation of asthma as a reasonable one and this theory is confirmed by the results of our system of treatment. The explanations given for the mechanisms of these exercises are however based on accepted physiological principles. These exercises must be learnt from one who has done them, preferably a medical man. Since the average medical practitioner is not conversant with Yoga, this book is intended to help him in that direction also. *However, this book is primarily intended for those asthmatics, who believe that it is their birthright to be healthy, without having to resort to medicines.*

The Yogic exercises mentioned in Chapter VIII are for general health and bear some

valuable references to the cure of asthma. Their special features lie in (1) increasing the circulation of the cerebro-spinal fluid and of the blood-supply to the entire nervous system. This means increased nutrition to the nervous system ; (2) increasing the mobility and suppleness of the vertebrae and thereby releasing any existing blocks to visceral reflexes ; and (3) exercising the spinal cord and the sympathetic gangliated chains. *Sirshasana* is a fine stimulant to the sympathetic nervous system. By sheer pressure the cerebro-spinal fluid stimulates the pituitary gland to pour more of its secretion into this fluid. Therefore it should be an exercise of choice to the asthmatic. The weak ones may stop at Stage 2 of this exercise. *Matsyasana* is also very good. Some chronic asthmatics need *these exercises also* for their cure, and have to give another 9 minutes for these. Beginners are advised to perform Viparitha Karani and Matsyasana. The latter corrects the asthmatic deformity. The others should be done at a later stage. Each asana may be practised from 15 seconds to 3 minutes.

If an enemy sets foot on one's territory all the available resources are harnessed to kill the enemy. In the same way all the avenues of energy should be searched for and utilised to the full to overcome asthma. Pranayama increases our *pranic energy* and we have discussed what this energy is and its place in the life-processes of our body in Chapter X under the heading 'Prana-maya-kosha.' When a man is pessimistic, dejected and loses interest



in life the pranic circulation is seriously affected and the normal functions of the body are in abeyance. We have cited a case, where a man for this reason died of inanition though he was over-stuffed with food. This chapter gives one greater insight into and appreciation of this wonderful energy. Clairvoyants describe in detail the various currents of prana that circulate in the body during pranayama, but we have not embodied such descriptions in the text. We have, however, given sufficient experimental evidence for the existence of pranic energy and the methods by which Yoga harnesses this energy. There is the great *Solar Energy*, which we can utilise directly for the conquest of asthma. The utilisation of this energy is explained in Chapter VII. We can also utilise the solar energy indirectly through food, because the energy of food is obtained from the sun. The valuable researches of modern physiologists tell us how best we may utilise this *food energy* to the maximum advantage, without at the same time clogging the body with excess of nutriment resulting in intestinal putrefaction and fermentation, diabetes and albuminuria. These diseases, which are at once a challenge to and an indictment of modern physiology and medicine, are preventible. Food has become a liability! On the other hand an asthmatic is shewn in Chapter X how best to utilise this food energy as a reserve power to combat asthma. The contribution of Ayurveda in the classification of foods into sympathetic stimulants and para-sympathetic stimulants is also discussed in

the same chapter. The average asthmatic will obviously do well to select his foods from the list of sympathetic stimulants, since these are antagonistic to the vagotonia of asthma. There are certain exceptions (described in the same chapter) whom the para-sympathetic stimulants suit.

Most of the modern Ayurvedic books on *Materia Medica*, if not all, unfortunately give a misleading definition of the word 'Shita-virya.' For example the '*Materia Medica*' by Vaidyaratne C. S. Murugesu Mudaliyar Avargal, which is used as a text-book in the Government Indian Medical School, which is considered to be one of the very best Ayurvedic Colleges in India, defines a drug that possesses (or produces) 'Shita-virya' as one "having cooling properties or lowering the bodily temperature." When the same author defines a drug that possesses (or produces) 'Ushna-virya' he does not make such a bad mistake, and defines it as "an agent exciting the functions of an organ or some process of the body economy." There are other books on Ayurvedic *Materia Medica* where the word 'virya' is omitted altogether! Since the word was not understandable the authors concerned seem to have left it alone! To come back to the question why the definition given above of 'Shita-virya' is wrong, we have only to consider the function of rice, wheat, grapes, potatoes, dhal, etc. taken from the long list of articles that possess this virya and discuss their qualities. We all know that these articles



produce much heat in our bodies, many times more than an equal number of articles taken from the list of articles that possess 'Ushna-virya.' Rice and wheat are the staple foods of man that, for any given meal, produce the largest amount of heat. It is therefore obvious that that definition is wrong. It is not proper here to go further into this most interesting discussion, but suffice it that the articles given in our list of sympathetic stimulants possess 'Ushna-virya' and are beneficial, while those in the list of para-sympathetic stimulants possess 'Shita-virya' and are harmful to asthma, according to orthodox Ayurveda.

Want of sleep is a most distressing feature in asthma. Mc Dowall, who is both a psychologist and a physiologist, is most frank when he writes in his "Handbook of Physiology and Biochemistry" with reference to sleep. "Its exact nature is not clearly understood." Its theory, according to Yoga, is most inspiring. Therefore we have given it a place along with 'Relaxation' in Chapter VIII under Section B and discussed it further in Chapter X under 'Fasting,' without delving into *Turiyam* and *Turiateetham*, which are experienced by a Yogi during 'conscious sleep.' That posture affects functional albuminuria is recognised in Modern Medicine. In the same way, Yoga advises asthmatics to get used to sleeping on the left side. It exerts a curative effect, in the long run, on asthma.

In conclusion we would like to mention that ten years ago a doctor friend of ours was suddenly seized with Bronchial Asthma. He knew Yoga and we requested him to do these 4 Special Exercises including the one in the 5th Chapter. He practised them and, to his great delight, found that they cured his asthma completely and he has not taken a grain of medicine ever since.

I have great pleasure in thanking His Holiness Swamy Sivananda, a well-known doctor and a great Yogi, and Hon. Mr. S. W. R. D. Bandaranaike, Minister of Health and Local Government, for their very valuable Forewords, and Mr. R. S. S. Gunewardene, President of the Board of Indigenous Medicine, for his generous introduction and kind references to me, and my former pupil Vaidya Kalanidhi S. V. Sandrasegaram, D.I.M. & S., for readily demonstrating the various asanas incorporated in this book.

T. NALLAINATHAN.

"Kathiramalai,"  
Castle Lane,  
Colombo 4,  
Ceylon, 16-12-50.



## CHAPTER I.

### THE NATURE OF BRONCHIAL ASTHMA.

"Asthma" is the common word for Bronchial Asthma. In Medicine there are also Cardiac Asthma and Renal Asthma, which are caused by diseases of the heart and kidney respectively. The asthma in these two latter diseases is only a part expression of another disease and not the disease itself; while Bronchial Asthma is a disease in itself. It is this with which we are concerned. In Bronchial Asthma the smaller bronchi are contracted. These are circular tubes through which the air we breathe in enters the lungs. Through the same tubes the air from the lungs is expelled. Of course the bronchi form only a part of the tube system between the nose and the lungs. The air goes in inspiration through the nostrils, pharynx, larynx, trachea, bronchi and bronchioles (*i.e.*, small bronchi) from the external world to the lungs, and in the reverse order in expiration from the lungs to the outer atmosphere. The 1st Plate shows the passage of the air from the nostrils to the trachea, the 2nd Plate shows the larynx, trachea, bronchi and bronchioles. They form one continuous tube. The trachea at its lower end divides into 2 bronchi, one for each lung.



The bronchi consist of a framework<sup>o</sup> of imperfect rings of cartilage united by fibrous and muscular tissue; the bronchioles (bronchiole is the diminutive of bronchus) branch and sub-divide and become very narrow and are reduced to 1/40th of an inch in diameter; they lose their cartilaginous element and their walls are formed only of a fibrous elastic membrane with muscle fibres. The bigger bronchioles can be seen and rolled between two fingers. The muscles are supplied by two nerves, one called the vagus which contracts the muscles when stimulated, and the other called the sympathetic which relaxes the muscles when stimulated. When the muscles contract the small bronchial tubes are narrowed down so greatly that there is very little room for the air to go through; hence the great difficulty and distress experienced. When a blast of wind goes through a narrow space a sound is produced. This is the familiar wheezing sound heard in asthmatics during a paroxysmal attack. The difficulty experienced in breathing is chiefly during expiration.

### Mechanism of Inspiration and Expiration.

In inspiration the muscles of the chest wall contract and cause the volume of the chest to increase. When this takes place a vacuum is created between the lungs and the chest wall. The elastic lungs immediately fill this vacuum; the volume of air space inside the lungs is increased and therefore the pressure of the air inside the lungs is less than

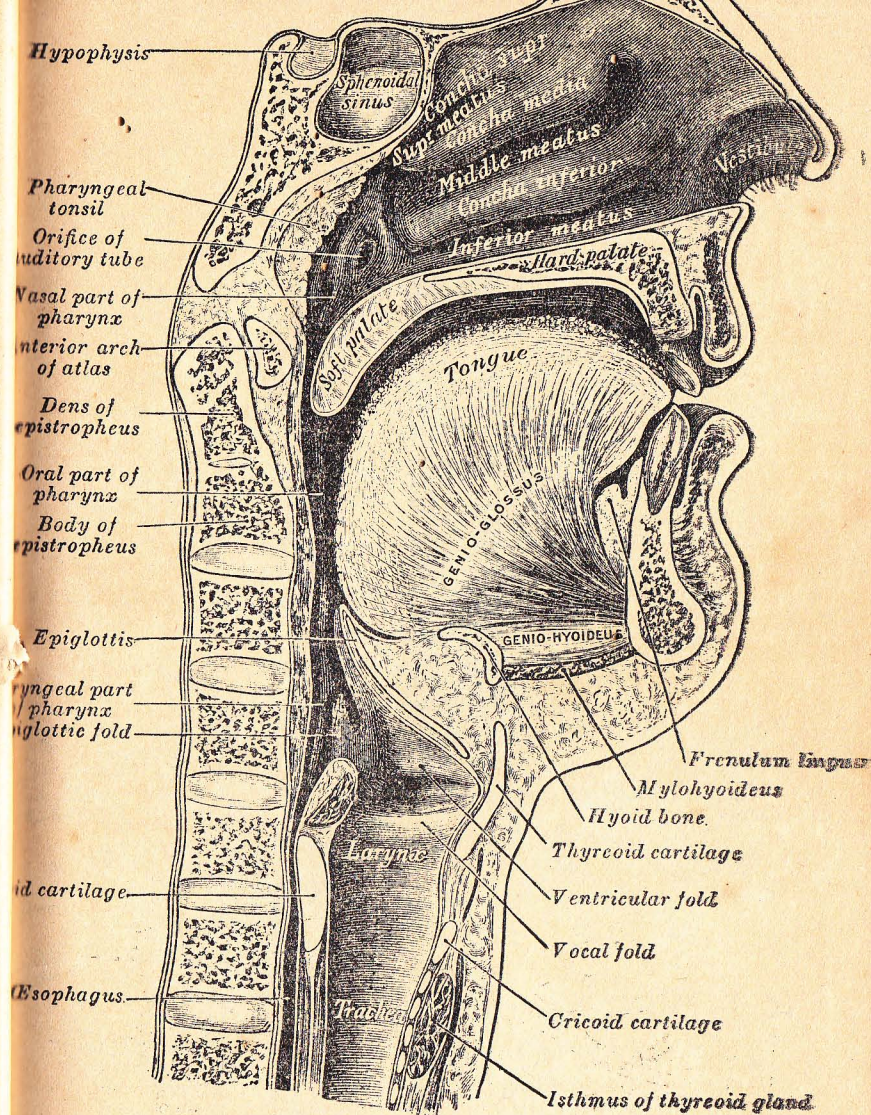


PLATE 1.

Anterior of Nose, Mouth, Pharynx and Larynx.

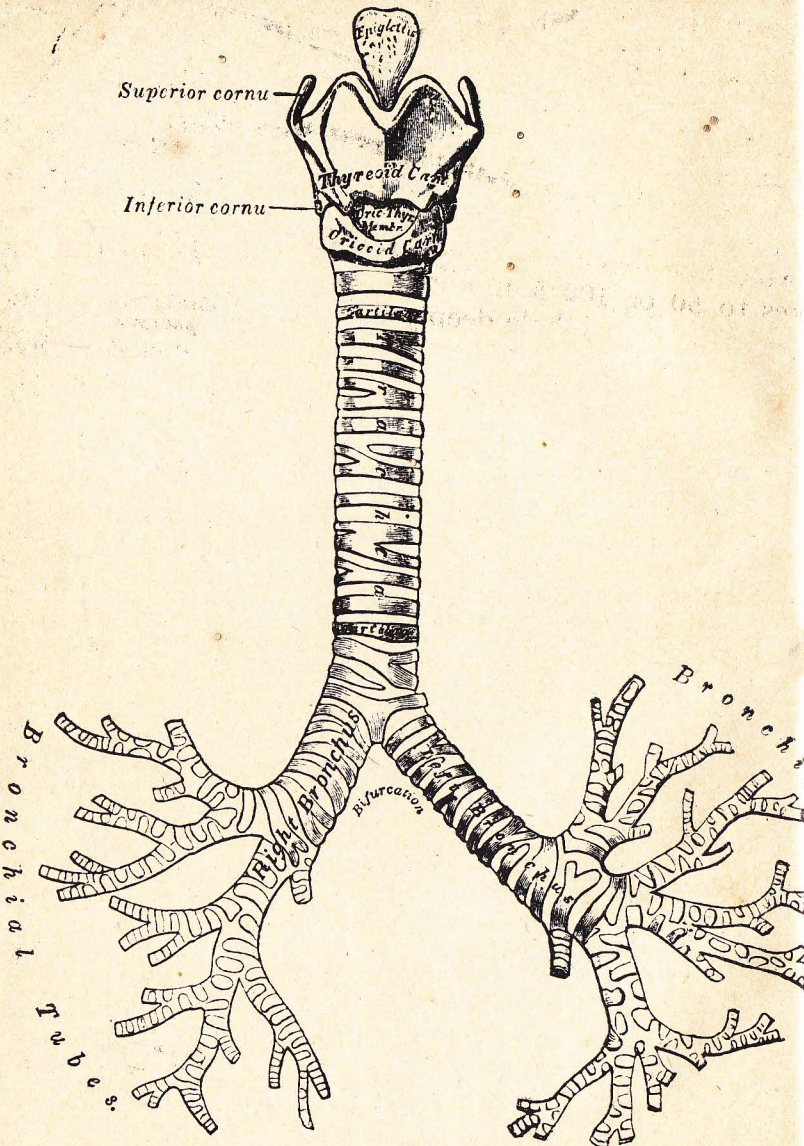
The Hard and Soft Palate separate the nose from the mouth.

The Cricoid Cartilage is the lower limit of both pharynx and larynx.

The Hypophysis (Pituitary body) above, and the vertebrae on the extreme left.

(Gray)





## PLATE 2.

Larynx, Trachea and Bronchial tubes.

The Cricoid Cartilage is the lower limit of the Larynx.

( Gray ).

that of the atmosphere, with which it is in communication. The atmospheric air now rushes into the lungs. This is inspiration. When we examine one through a fluorescent screen we see during inspiration the big sheet of muscle called the diaphragm, which separates the chest from the abdomen, coming down parallel to its original position ; the chest wall also is seen to expand. During expiration the reverse takes place, *i.e.*, the diaphragm ascends and the chest contracts. This process of ordinary expiration is entirely a passive one, *i.e.*, the muscles, which contracted during inspiration now relax and the elastic lung-tissue which was stretched returns to its original state. Since expiration is a passive process, we can see why it is specially difficult for the air to go out when the bronchi and bronchioles are contracted as in asthma. On the other hand since inspiration is an active process, air is forced through the contracted tubules and therefore there is not such great difficulty in inspiration as in expiration. In a normal person in inspiration the bronchi dilate while in expiration they constrict. This also accounts for the above.

In Bronchial Asthma the musculature of these tubes suffer paroxysmal contractions, which may last from a few minutes to some hours, nay some days. When it lasts some days and nights it is called 'status asthmaticus' ; during this period food cannot be taken, and sleep becomes impossible till drastic treatment is instituted.



When expiration is difficult and prolonged it is found that the lungs are not completely deflated, before another short and spasmodic inspiration sets in. The lungs become more and more distended and the thoracic movements more restricted. The face becomes pale and anxious, the finger tips cyanosed and if neglected the limbs get cold.

When the lungs get permanently distended as a result of many neglected attacks the condition of the lungs is known as emphysema. Here the shoulders are held high and the whole chest is permanently increased in size. It looks like a barrel and loses the usual suppleness and elasticity. The alveoli in the lungs get blown up into extensive chambers (*vide* Plate 3) in many places since the inter-alveolar septa have disappeared. These septa support the blood capillaries concerned in the gaseous exchanges of the blood so that their disappearance is a vital loss. Therefore it is wise to take the following breathing exercises and cure the asthma before letting it develop to this stage.

*Experimentally when we stimulate the vagus motor nucleus or nerve we get a condition exactly like Bronchial Asthma.* In asthma the mucous membrane of the bronchi and the bronchioles become turgid and much thick secretion is formed. The bronchial muscles are in spasms and the small bronchioles practically close.

## The Nature of Normal Respiration and the Automaticity of the Respiratory Centres.

In that part of the brain called the medulla oblongata there is an area near each vagus nucleus (or central end of the vagus) called the respiratory centre. Experiments show that it is closely connected to another centre called the pneumo-taxic centre situated in the pons varolii which lies just above the medulla. Latest researches prove that these two respiratory centres (right and left) *have an automaticity, i.e.,* they function rhythmically on their own. In other words they send the necessary impulses to all the muscles concerned to cause inspiration and expiration regularly, one at the end of the other. Each of these two centres has as its sub-divisions an *inspiratory centre* and an *expiratory centre*. These are of course closely connected to each other and the central ends of the vagus by nerve fibres. The expiratory centre is a little closer to the vagus end than the inspiratory centre. When the inspiratory centre is stimulated by rapid faradic shocks in an experiment on an animal regular breathing is suspended and a deep inspiration, where the thoracic muscles and the diaphragm take part, occurs, and the breath is held in that position as long as the stimulation is kept up. When the expiratory centre, which lies dorsal to the inspiratory centre, is similarly stimulated, relaxation of the diaphragm and the other inspiratory muscles occurs and the position of expiration is



kept up during the period of stimulation (within 3 minutes). The inspiratory centre is the dominant one if both are equally and simultaneously stimulated.

The pneumo-toxic centre has the power of inhibiting the respiratory centres. In the cerebral cortex are situated two centres, one

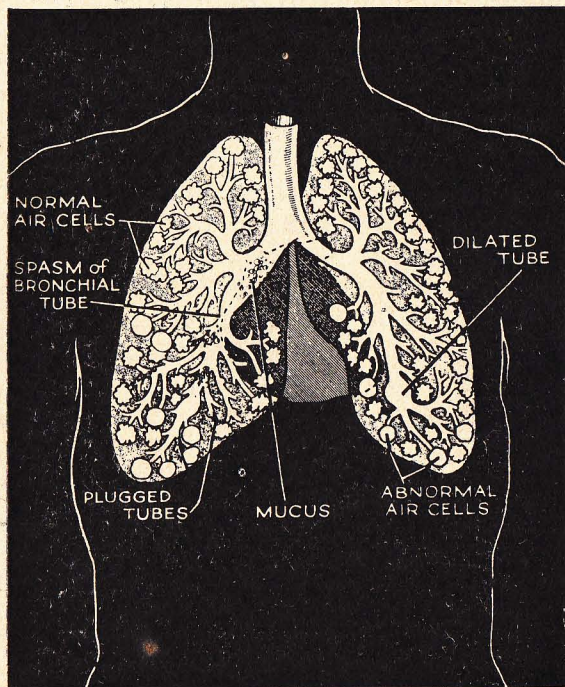


PLATE 3.

Right Bronchial Tube in spasm.  
Mucus-plugged Bronchi and dilated tube.  
Normal and abnormal air cells in the lungs.

for accelerating and the other for inhibiting the respiratory centres. The accelerating centre is situated a little in front of the motor area of the cerebrum near its supero-medial border. Our will works through these cerebral centres in our various breathing exercises.

The sovereign power of initiating inspiration and expiration, however, resides only in the two respiratory centres. If these centres are diseased respiration becomes abnormal. If these centres are destroyed respiration stops, *i.e.*, there is death.

It is interesting to note that when the foetus is in the mother's womb the heart and circulation work, but not the lungs. Only when the baby is born is the first inspiration taken and the respiratory centres begin to function. They continue to send their rhythmic impulses of inspiration and expiration all through life till the Messenger of Death greets them.

### The Nature of Cough.

The mucous membrane of the larynx and the bronchial tubes is supplied by branches of the vagus. When there is an irritation caused by mucus or cold air, this irritative impulse is carried by the vagus to the expiratory centres. In the same way when cold air or dust-proteins or air containing irritative substances like chilli powder impinge on an area called the asthmagenic area of the nose (*vide* Chapter XI) the impulses are conveyed by the 5th cranial



## CHAPTER II.

### THE CONQUEST OF THE PAROXYSM AND THE PRINCIPLES OF CONQUEST.

The very first breathing exercise is called **Ujjayi**. The meaning of this Sanskrit word is "leading to victory." The word 'jaya' is always found in our National Anthems; again the familiar Indian expression 'ki-jai' signifies the same meaning. There is also another meaning for 'ujjayi,' that is 'pronounced loudly.' This breathing does produce a sound for it is done with the glottis partially closed.

In Plate 5 are the two vocal cords. The space between them varies with the sound we produce. A note is determined, among other factors, by the space between these two cords. In Ujjayi, we bring the two vocal cords nearer each other than in normal breathing. Therefore when the air rushes through this narrow slit, it makes a hissing sound.

This exercise looks difficult, but when one sees another doing it, it becomes child's play. Both inspiration and expiration are done with the vocal cords approximated. The sounds produced are similar to asthmatic breathing. The muscles concerned in the movements of the vocal cords are innervated by branches of the vagus nerves, the same nerves that innervate the muscles of the bronchioles.



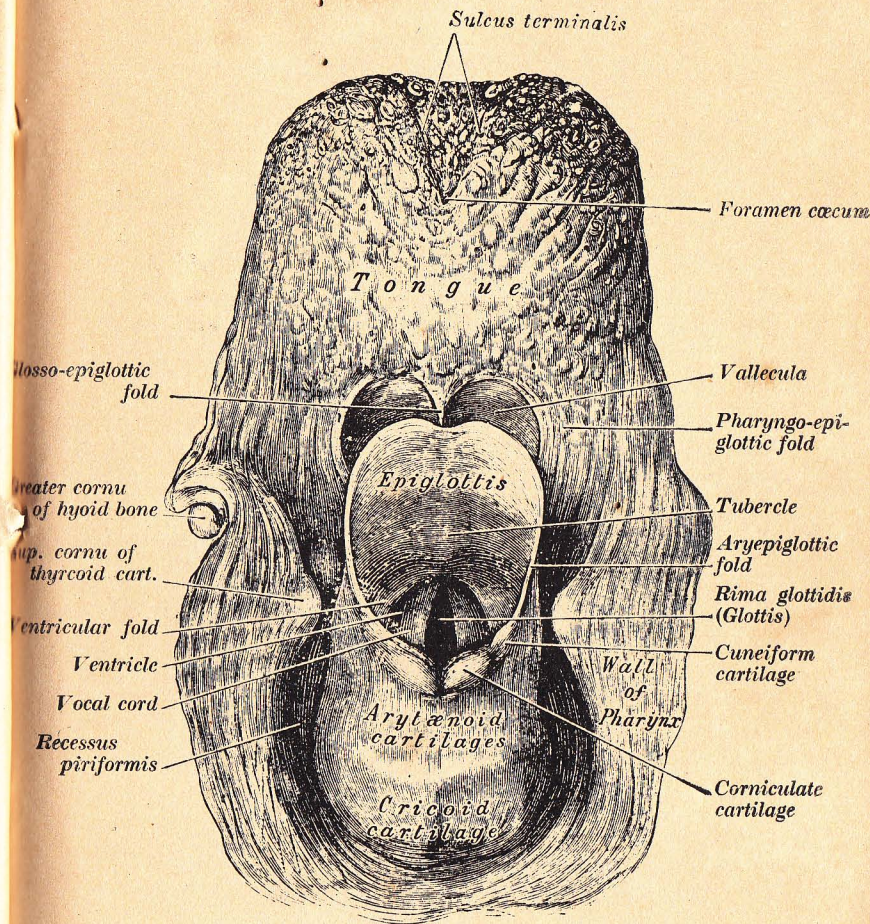


PLATE 5.

The Glottis, Vocal Cords and Tongue.

( Gray ).



\* *The principle* underlying Ujjayi is that we learn to control these bronchial muscles, through the two vagus nerves. The lay-reader may not be familiar with the fact that a nerve carries an impulse to its muscle and causes its contraction. † In an asthmatic paroxysm the bronchial muscles contract and the patient is helpless; here we reverse the process. We voluntarily cause contraction of these muscles and regulate the breathing under such conditions. We soon find with a little practice that we gradually control these muscles; and the muscles can no more control us.

The diagram in Plate 6 shows the vagus nerve going from that part of the brain called the medulla to muscles of the bronchi and to the lung alveoli. This nerve supplies also the heart, stomach, intestines, etc. In asthma the impulses are being continuously sent through the right and left vagus nerves to the bronchial muscles and spasmodic contractions of these muscles take place.

In Ujjayi we voluntarily send impulses through the vagus nerves to the intrinsic muscles of the larynx to approximate the vocal cords and learn to breathe well under such conditions. We are of opinion that the bronchial muscles also can be contracted in this

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\* Ujjayi increases pituitrin, which relaxes bronchiole-muscles (*vide* Preface).

† When the vagus is stimulated acetylcholine is liberated at its terminals. This chemical substance causes the contraction of the bronchial muscle, and it is soon destroyed.



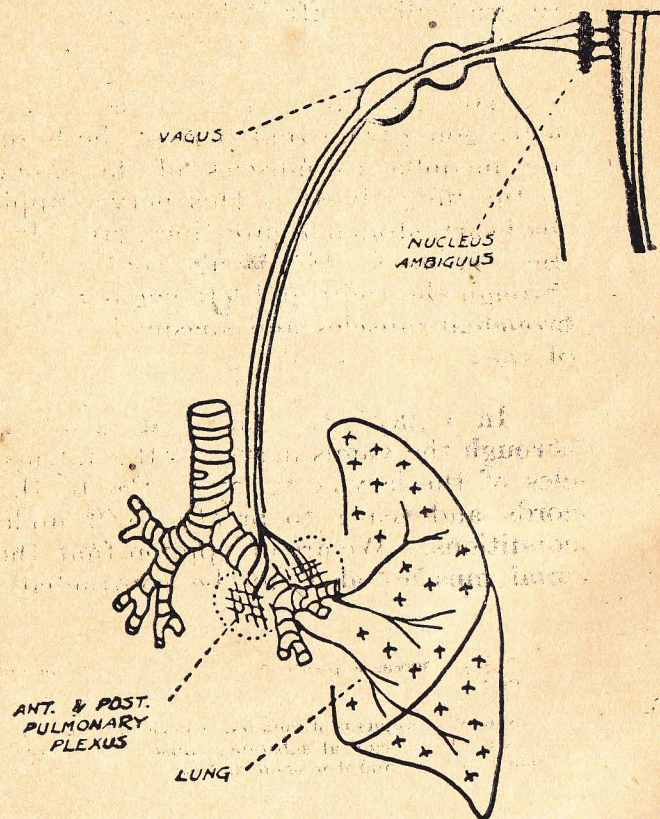


PLATE 6.

Nucleus ambiguus, a vagal centre, in the Medulla.

The Vagus supplies the Bronchi and the Lungs.

exercise, if we so will, because the same impulses will be carried to them also. We find the heart contracting more forcibly and at a slower rate during the exercise. Western physiologists assert that we can have little or no control over the bronchioles and the heart. Our Yogis, ancient and modern, challenge and disprove it. They rightly say, that if we can send the necessary impulses to control the vocal cords, we should send the necessary impulses through the same vagus to the bronchioles also. We know of one who could stop his pulse for a few seconds at will. In Bombay Yogi Deshabandu exhibited the stopping of the pulse-beat in the radial artery and in the temporal artery before a group of eminent physicians. He made his heart beat inaudible to the stethoscope; simultaneously an X'ray screening and an electro-cardiogram were taken. It was found that during the inaudible period (6 seconds) the heart became smaller with the apex moved  $\frac{2}{3}$  inch internally from its normal position; but the heart contractions were present. (Rele).

More than one Yogi \* had demonstrated complete cessation of respiration lasting some days, nay months, by burying themselves underground in the presence of eminent men. In the 1st Chapter we have mentioned that during inspiration the bronchi dilate and during

\* In 1856 a Yogi was buried by General Ventura in the presence of Maharajah Ranjeet Singh and disinterred alive after 10 months in the presence of Capt. Wade and the Maharajah. The latter dug up twice during the ten months to ensure that the precautions, he took, were all intact; and they were.



expiration they constrict. It has been found, with the aid of the bronchoscope and by X-rays after the injection of lipiodol into the bronchial tubes, that the bronchi have a rhythm identical in timing and character with that of the vocal cords. This is due probably to the action of the respiratory centres. At each inspiration the broncho-constrictor impulses which pass down the vagi are inhibited and the broncho-dilator impulses which pass down the sympathetic are stimulated. At each expiration the reverse takes place. Therefore it is clear that during expiration in Ujjayi the cords are approximated very much and the bronchi are equally constricted. This supports our contention.

One inspiration and one expiration constitute one round. When we stop the exercise at the end of a round the muscles relax. We repeat many rounds in each sitting and we soon learn to have an easy control over these muscles. That is, we get to know how to relax contracted muscles and *vice versa*. This becomes as easy as our control over our limbs.

Ujjayi alone in incipient cases stop further paroxysmal attacks of asthma. It may be done in the car or while being seated in the office, or while walking. It need not be done on an empty stomach only. The number of rounds may be gradually increased to 100 or 200 a day. As we learn to breathe in this way, we will soon find that our breathing becomes fuller day by day. Normally a man breathes 15 to 20 times a minute. We find that during

Ujjayi the rate of breathing comes down easily to 5 a minute, and with greater practice to 1 a minute. This means that our intake of oxygen becomes richer and fuller than before this exercise. So is the exhalation of carbon dioxide. This in itself makes for robust health. The very fact that 20 breaths per minute are brought down to 1 a minute shows the degree of control we have achieved over the two vagus nerves and the respiratory centres.

Physiologists thought that the entire lung expands simultaneously at every point during inspiration. Keith found that this is not so, but that the lung expands like a Japanese fan, *i.e.*, part by part. Those who do Ujjayi realise this truth. Our ancients obviously were aware of it. A normal inhalation takes 1 or 2 seconds but in deep Ujjayi it takes 8 to 10 seconds and as we inhale we feel the air distending new and fresh parts. After practising Ujjayi for a few weeks as depicted above, students should practise retention of breath or Kumbhaka between inhalation and exhalation and to a less extent between exhalation and inhalation. In the 4th Chapter we have explained how this is done and described all the benefits that accrue from such practice, including control over the respiratory centres.

When we perform Ujjayi we find that the intake of air is much more than in ordinary inspiration. When we measure the vital capacity of an individual in the accepted way and then during Ujjayi we find there is an increase of 200 to 400 ccs. Vital capacity is measured,



by taking a forced inspiration and then exhaling to the utmost into the mouth-piece of a spirometer.

When Chapter V is read and understood, the significance and meaning of this chapter for an asthmatic will become more clear.

**Summary of Exercise:** The inspiration and expiration are done with a certain sound caused by the approximation of the 2 vocal cords. With practice retention at the end of inspiration must be done. The duration of inspiration, retention and expiration are in the proportion of 2 : 8 : 4. An inspiration, retention and an expiration form *one round*. *It may be done at any time, anywhere.*

In all, 100-200 rounds are prescribed for a day.

In the early stages retention may be omitted; and for a beginner 7 rounds are advised for a sitting.

## CHAPTER III.

### CONQUEST OF COUGH AND THE PRINCIPLES OF THE CONQUEST.

This is the 2nd breathing exercise. It is known as **Bhastrika**. This Sanskrit word means 'Bellows.' In Bhastrika there is a series of quick expulsions of breath producing a sound characteristic of that of the blacksmith's bellows.

Here we sit on a chair or squat on the floor in oriental fashion, with the spine erect. Those who know the asanas (postures) in yoga may with advantage assume the Padmasana; for our purpose sitting on a chair is quite in order. We inhale and exhale quickly ten times without a pause between them. The breathing is of the abdominal or diaphragmatic type. It is the abdominal muscles that contract vigorously and quickly and in each stroke the abdominal viscerae are pressed and the diaphragm is pushed up. As soon as this is over, the abdominal muscles relax, the abdominal viscerae come down, the diaphragm also comes down and since the cavity of the chest is increased air enters the lungs. Now the abdominal muscles are again contracted for the 2nd stroke and the whole process is repeated again.



It must be noted that the intercostal muscles (*i.e.*, the muscle of the chest wall) are kept contracted right through each round; this may sound strange in theory, but while practising, the truth is obvious. From the above it is clear that the inspiration is done silently without any effort on our part whereas the expiration is done with an effort at contracting the abdominal muscles; necessarily when the air is forced out through the nostrils, a sound is produced like that of the bellows. Since the inspiration is slow and soft it is not noticeable and therefore the exercise looks as if it consists of a series of forcible exhalations.

The depth of the exhalation is a little more than in ordinary breathing but certainly it is not so deep as in Ujjayi. The time the exhalation takes is only a fraction of that required for inhalation. The number of exhalations is ten for a start but should be increased to twenty in course of practice. The advanced students may increase it to 50 or 100 a minute. However, the best guide for the number of exhalations is our feeling of healthy fatigue. When we feel this we make the last exhalation of this series and take in a deep breath. A beginner is advised not to retain the breath but to make an exhalation at the end of the deep inhalation. After sufficient training retention of breath should be practised at the end of the deep inhalation (*vide* next Chapter). Now a round is completed; it starts with a short exhalation and ends in an exhalation. Three rounds are done in each

sitting and it is advisable to have two sittings a day. The number of rounds may be increased to 5. Between any two rounds there should be an interval of a minute or so, when normal breathing is allowed, so that we may be quite fit for the next round. An asthmatic subject will notice cough developing towards the end of each round. The phlegm should be expectorated when it comes up. After some time there will be little or no phlegm to be coughed out. The cough will then automatically disappear, but not always. With sustained practice at this exercise it will disappear. Lumsden has shown that the passage of air over the mucous membrane of the air passages acts as an inhibitory stimulus. We learnt in the 2nd Chapter at Page 44 that during inspiration the sympathetic is stimulated. Since the period of expiration is only a fraction of that of inspiration, the total time spent in inspiration is greater than that in expiration. Therefore the final effect of this exercise is sympathetic stimulation, which is beneficial to asthma.

In the phenomenon called cough there is first a deep inspiration and then an expiration. In the latter the abdominal muscles contract forcibly and the diaphragm is shot up by the abdominal viscerae expelling the air in the lungs. The glottis which was momentarily closed is now suddenly opened by the expiratory blast producing the sound of the cough. In Bhastrika we contract the abdominal muscles as in successive bouts of cough, but the glottis, which was closed at the end of each



inspiration, is opened quickly (but not suddenly) without causing the sound of the cough. It must be remembered that a quiet inspiration is taken before each relatively noisy expiratory effort in this exercise. Therefore in this exercise we simulate the muscular movements of coughing without producing the sound and discomfort of cough. This is how cough is got over.

This exercise is further variegated by keeping the *glottis slightly narrow* (as in Ujjayi) during the successive expulsions; we therefore repeat voluntarily almost what obtains in natural cough, with the great difference that we learn not to cough during the exercise. The glottis should not be greatly narrowed lest damage to this sensitive structure by the forcible current of air takes place. It will be noticed that when we speak or laugh the air passes out from the lungs through the glottis. It is at the stage of passing through a narrow glottis that the phenomenon of cough takes place in asthma. There is an increased volume of residual air in asthmatics especially in the lower parts of the lungs. This exercise ensures the healthy removal of this excessive residual air. In the early stages of functional emphysema caused by asthma Bhastrika not only removes this emphysema but helps very much in the restoration of the lungs to normality.

The congestion in the bronchi and bronchioles is decreased in gradual and successive stages; and the mucus is separated by the

blasts of air from the bronchial walls and coughed out. After some time there will be no more mucus to excite a spasm.

The powerful expiratory blasts of air through the entire respiratory passage, as mentioned earlier, acts as a powerful inhibitory stimulus to the expiratory centres. Therefore the cough and the associated spasms of the bronchi visibly diminish at every sitting. This is the *principle* underlying this exercise.

The organs in the abdomen are thoroughly massaged in the exercise. The liver, the spleen, the kidneys; the adrenals, the stomach and the intestines have their full share in the massage. A bloated abdomen is converted into a healthy one within a few weeks of practice. A constipated individual no more complains; there is a regular action of the bowels after the exercise. The gases in the stomach and intestines are sent out and after a few months of practice the abnormal gas-formation will cease. One feels light in body and more lively. Massage of the adrenals tends to be as good as giving a small injection of adrenalin. As mentioned in the Preface this exercise and deep Ujjayi increase the production of pituitrin. The number of strokes in the former should exceed 50 per minute for this purpose. The oxytocin principle of pituitrin relaxes the bronchiole muscles. Five minutes of Bhastrika raises the Systolic Blood Pressure from 125 to 130 mms. Hg. Increased production of adrenalin must also take place.



In Yoga this exercise is said to awaken **Kundalini Shakti**, a spiritual force, now latent in man, to dynamic activity. The forcible movements of the abdominal muscles press the viscerae on the solar, renal, mesenteric, aortic and hypogastric plexuses of the autonomic nervous system and stimulate them to activity. When we give a hard knock just above the navel to a man, he becomes unconscious, because the knock makes a sudden bang on the solar plexus. The vagus also sends branches to this plexus. The regularly repeated stimulation of this and other plexuses releases a new energy. An analogy may be given here to elucidate this. In cases of asphyxia in newly born babies, we remove the mucus from the respiratory passages, and induce artificial respiration successfully. The artificial respiration stimulates the respiratory centres to function and releases life in a suffocated baby. In the same way Bhastrika stimulates the plexuses of the autonomic nervous system and releases Kundalini Shakti. This exercise should be done on *an empty stomach only* and never after the smallest meal.

If, due to cold, one nostril is partially blocked, then the expirations may be done with advantage through that affected nostril. To do so we close the other, *i.e.*, unaffected nostril with the right hand.

A beginner is advised to do this exercise with the glottis fully open as in normal breathing. One is quite fatigued by the exercise. It is considered to be the best exercise to begin

every sitting with, especially early in the morning. An asthmatic will enjoy doing this exercise on bed, on waking up in the morning. It also removes laziness and sleepiness then and there.

Incidentally the heart is massaged. The pericardium, *i.e.*, the sac within which the heart is situated, is attached to the upper surface of the diaphragm. Therefore with each forcible upstroke of the diaphragm the heart is massaged. The major part of this exercise is common to Kapalabhati. This word means an exercise that makes the skull shine. "Kapala" means in Sanskrit and Tamil 'skull,' and "bhati" means 'to shine.' This exercise undoubtedly cleanses the respiratory passages in the skull very well, and one's face looks much brighter after this exercise than before.

We have just referred to retention of breath. We shall deal with it fully in the next chapter. Advanced students will experience the 'second wind' during their practice. At this stage, a shoulder may be depressed for a part of a round and the other shoulder for another part of the round. This ensures a thorough expulsion of the air from the lower part of the lungs on either side.

Children can be made to take this exercise comfortably. In the case of children under 7, we ask them to breathe out quickly and forcibly through an open mouth. We help them



further by placing a small balloon on the table and asking them to push it away by blowing air through the mouth at the balloon. At the end of every five exhalations there should be a deep inhalation.

**Summary of Exercise:** Sit on a chair or squat on a bed. Inhale and exhale quickly 10 times without a pause between them. The abdominal muscles work like bellows. Increase the number of strokes to 50 or 100 a minute. At the end of the last exhalation inhale deeply and retain it. Now exhale deeply. This constitutes one round. Do 3-5 rounds, and between any two rounds let there be an interval of a minute or so. At the start retention may be omitted. Time: 3 minutes.

## CHAPTER IV.

### KUMBHAKA OR RETENTION OF BREATH AND ITS SIGNIFICANCE.

#### Deliberate Control of the Respiratory Centres and Vagus Nuclei.

In Yoga the word Pranayama is used to signify breathing exercises. \* Prana means breath, and yama means to stop; therefore the stoppage of breath is what is meant by this word and it is an integral part of the exercises.

In Pranayama we inhale fairly deeply and then retain the breath as long as we comfortably can; then we slowly exhale. This forms one round. In text-books on Yoga we are advised to retain for a period four times as long as that of inspiration and to exhale for a period twice as long as that of inspiration. For example, if we inhale for 3 seconds we are to retain for 12 seconds and exhale for 6 seconds. This is of special importance for the cure of asthma, since, as we have studied at Page 44 of Chapter II, the sympathetic is stimulated during inspiration.

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\* Prana, in another context, also means primordial energy. Even when the mind is silenced by deep sleep prana is active and enables breathing and all other functions of the body to take place.



The 2nd round should begin on the heels of the 1st round without a pause. Three rounds could be taken by any novice with comfort. We advise seven rounds for a sitting after a certain amount of practice. It may be increased gradually to about 50 or more a day.

We advise the beginner to do this exercise, preferably seated, and on an empty stomach, in front of a mirror. During retention there must be no discomfort at all. We move the chest wall a little to this side or to that, raise one shoulder or the other to adjust all the muscles concerned to remain at ease. We all have our chest in certain fixed positions without our knowledge. We notice this defect in others, but not in ourselves. During retention the chest in both sides should be symmetrical, otherwise there will be a 'catch' somewhere and great pain will result after the exercise.

We advise Pranayama in Ujjayi. That is inhalation through a partially closed glottis, retention and exhalation through a constricted glottis as in inhalation.

There may be a little pain in the chest wall, if an elderly person does it vigorously; vitamin B is very useful. It may be taken as Marmite or Bemax. Yeast tablets are very cheap; they could be taken 2 at a time, three times a day with meals.

This exercise is forbidden after a meal. At least  $4\frac{1}{2}$  hours, preferably 6, should elapse

after a solid meal. Half that time is enough if it is a liquid meal. The younger the person the more easy it is, since the joints of the ribs are more flexible than in any elderly one. As long as one observes the golden rule, *viz.*, that no discomfort or strain should be felt during retention, the exercise may be done care-free and without fear by any one old or young. We also advise a smaller number of rounds with Kumbhaka at the end of exhalation. Such a round will have inhalation, exhalation and retention.

Now let us discuss the significance of retention. We must first understand a little of the Anatomy and Physiology of the chest viscerae. The heart is enclosed in a strong sac called the pericardium, the lower part of which is attached to the central portion of the upper surface of the diaphragm. On either side of the heart is a lung, which is enclosed by a closed sac called pleural cavity. This sac is composed of 2 thin, but strong, membranes. Inside the sac the pressure is negative, *i.e.*, below zero. This is readily understandable when by an accident a hole or puncture is created on the chest wall extending into the pleura; the external air immediately rushes in with a hiss and the lung collapses. This is the principle utilised in performing artificial pneumo-thorax for haemoptysis in consumption. From this it is clear that the negative pressure in the pleural cavity renders the elastic lung to be stretched a little. When we take an inspiration the negative pressure



increases, *e.g.*, if the normal pressure was —10 mms. mercury it may increase on inspiration to —30 mms. mercury. When this takes place the venous blood rushes up to the right auricle. Separating the pericardium and the blood vessels from the pleural cavity is only this membrane, *viz.*, pleura. Therefore when the pressure in the pleural cavity decreases the pressure in the right auricle and the two venae cavae, which take the entire venous blood to the right auricle, also decreases greatly. The pressure in the veins anywhere else, *e.g.*, in neck or abdomen is much higher. Therefore the venous blood automatically rushes into the right auricle. Leonard Hill rightly calls this action the *respiratory pump*. During inspiration the diaphragm presses on the abdominal viscera and therefore the pressure in the abdominal cavity is increased positively. The veins inside the abdomen will also share in this increase in pressure. With redoubled force therefore the blood in the abdominal veins will rush into the right auricle. The arteries inside the chest are not similarly affected, since their walls are thick and strong; and furthermore they have a definitely high degree of blood pressure compared to the veins.

When the pericardium distends as a result of this low chest pressure, the right ventricle, which is much thinner than the left ventricle also shares in the distention. Therefore more blood rushes from the right auricle into the right ventricle.

Retention is done at the end of inspiration. Therefore the increased negative pressure in the thorax is maintained throughout the period of retention. The increased flow of venous blood into the heart continues necessarily for a much longer period. This is the special physiological significance of retention of breath at the end of inspiration. Any other explanation, *e.g.*, increased absorption of oxygen due to great pressure of air inside the lungs, is not true. Increased blood flow into the heart means that at every systole or contraction the heart will send out an increased volume of blood. There will be no kind of stagnation in the venous return. The blood pressure rises during Kumbhaka to a marked degree; those with high blood pressure are forbidden to do Kumbhaka except under medical supervision. For example, in a Yogi who had normal pressure of 128 (systolic) and 90 (diastolic), during Kumbhaka it went up to 140 (systolic) and 110 (diastolic).

The heart is massaged. Thomas Lewis found that the pressure in the arteries is modified by deep inspiration and expiration. This is caused by the pull on the pericardium by the diaphragm according to Lewis. In retention this pull is maintained for a definite period of time and therefore the massage of the heart is great. In Bhastrika, the diaphragm in its upward stroke directly massages the heart.



## Deliberate Control of the Respiratory and Vagus Centres.

There is another very important significance in retention or Kumbhaka. The respiratory centres which automatically send impulses of inspiration and expiration are made to do what we want of them. When retention of breath is done at the end of a strong inspiration the inspiratory centre is greatly stimulated because the same phenomenon takes place when the inspiratory centre is artificially stimulated by a strong current (*vide* Chapter I); and the expiratory centre is inhibited, *i.e.*, its automatic impulses are stopped. The reverse takes place when we perform Kumbhaka at the end of a strong expiration, *i.e.*, inspiratory centre is inhibited and the expiratory centre is greatly stimulated. By doing this a large number of times a day regularly we learn to stimulate or inhibit either the inspiratory or expiratory centres at will.

When Kumbhaka is done during normal respiration the mechanism of control over the respiratory centres is as follows. In normal inspiration impulses run up the vagus to the respiratory centres causing inhibition of the inspiratory centre and stimulation of the expiratory centre (Hering-Breuer Reflex). When Kumbhaka is done at the end of inspiration these impulses are made inoperative, *i.e.*, the respiratory centres are made not to respond to these vagal stimuli. In other words we deliberately gain control over the respiratory centre.

The Hering-Breuer reflex is found not to operate during strong physical exercises, *e.g.*, high jump or a hundred yards dash. Therefore in order to gain great control of the respiratory centres it is advisable to perform Kumbhaka at the end of a normal or moderately strong inspiration. This should be the usual practice; but Kumbhaka should also be performed a few times at the end of a deep forceful inspiration.

When we retain breath after an inhalation that part of the larynx immediately below the two vocal cords is distended by air under pressure. This is an *asthmagenic* or sensitive area (*vide* Chapter XI). There is immediately a tendency to cough. But since we deliberately stop the cough, we attain control of the respiratory centres. In all these exercises our will plays its part by sending its impulses through the cerebrum to the respiratory centres.

In asthma the breathing is also abnormal and the respiratory centres seem to be tuned to this abnormal rhythm. This exercise rings out the old wrong tuning and rings in the new normal tuning. In asthma the expiration is prolonged and inspiration is not sufficient. We stimulate strongly the inspiratory centre by performing Kumbhaka at the end of inspiration and thereby cause more effective and powerful inspiration and simultaneously inhibit the expiratory centre. By experience, even as a violinist tunes the instrument, we learn to know the degree to which the inspiratory centre



should be stimulated and when such stimulation should be stopped.

We have studied in the 2nd Chapter that during inspiration the bronchi dilate, that the broncho-constrictor impulses are inhibited and that the sympathetic broncho-dilator impulses are stimulated. Therefore during Kumbhaka at the end of inspiration the broncho-constrictor impulses are greatly inhibited; *i.e.*, the *broncho-motor portion of the vagus nucleus is inhibited*. This signifies control.

The reverse takes place during Kumbhaka at the end of expiration. Therefore this is not advised in the early stages of one's practice; later when one has got over the asthma it may be done a few times, certainly a lesser number than Kumbhaka at the end of inspiration.

Kumbhaka soothes the nerves and gives a sense of bliss and a fragrance previously absent. That this is real can be verified by the reader in the following exercise. Look at the picture that you adore most; now perform Kumbhaka a few times\* with the eyes closed. On looking at the picture again one cannot help finding in that picture a freshness and a cooling fragrance that were not felt previously. There is a sense of bliss which is newly and freshly instilled by this exercise. When therefore this exercise is done regularly all these newly found qualities become part and parcel

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\* That is, you take a few respirations, and at the end of each inspiration perform Kumbhaka.

of one's being.' The entire nervous system suffers a soothing influence, and there will be no more over-action of the vagus producing the spasms. Irritability of the nerves gradually decreases and finally disappears. The error of metabolism (*vide* Chapter XI) caused by the exaggerated motor effect on the stomach and intestine, due to the irritability of the vagus nuclei, also disappears.

Every second hundreds of physiological and superphysical impulses\* are all the time travelling between the brain centres, the spinal cord, nerve plexuses, and the various structures of the body. We do not know the entire nature of these impulses. These impulses probably compose the great reservoir of force, which Yogis harness, to attain their miraculous powers or siddhis, *e.g.*, flying, traversing through solids, fire, water, etc. Once a noted Yogi in Benares unceremoniously snatched the sword from an English Viceroy, who called on him, dived into the Ganges and brought another identical sword, which he presented to his distinguished visitor. His Yogic power had suzerainty over the macrocosm also.

The breath is utilised as fly-wheel to start this process of transmutation of this reservoir of Spiritual Force. Kumbhaka seems to take an active part in the process of transformation. In asthma it certainly is of very great help in the removal of the irritability of the vagus

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\* In physiology text-books such impulses are not referred to since they are beyond the physical.



motor nucleus (*vide* Appendix I). No doubt the mind also takes an active part in this. According to Eastern physiology, Kundalini Shakti rises to Sahasrara (in Cerebrum) and causes profound physical, mental and spiritual changes in man transforming him into a divine being. Kundalini works through the Pranamaya-kosha, which is an invisible counterpart of our body. Death, according to Yoga, takes place only when this Kosha leaves the body; only then does putrefaction of the body take place. The latter is the final criterion of death, according to both Eastern and Western Medicine.

Dr. W. J. Kilner, M.R.C.P., M.B., had demonstrated by looking through a dicyanin or carmine screen the existence of such a body, which he called Aura. He could not find the aura in a dead body. For further information *vide* Chapter X and his book "The Human Atmosphere".

During Kumbhaka the sympathetic ganglia are pressed upon by the inflated lungs. Such sympathetic stimulation is good for asthma.

**Summary of Exercise:** Kumbhaka is done at the end of inspiration; for a less number of times it may be done at the end of expiration. There must be no strain felt. Strain indicates that the duration should be decreased. Kumbhaka is done as part of Ujjayi, Bhastrika and the author's exercise.

## CHAPTER V.

### AUTHOR'S SPECIAL EXERCISES.

#### A.

We have referred in the 2nd Chapter to the possibility of sending impulses through the vagus nerves to the muscles of the bronchioles and contracting them as in asthma. Yoga literature refers only to the narrowing of the glottis in Ujjayi. In this new technique we combine the elements of both Ujjayi and Bhastrika and consciously constrict the bronchi, bronchioles and the glottis. When we do it, a doctor examining us by auscultation will find the type of breathing and the accompanying murmurs exactly as in asthma. Our attention should be focussed more on the bronchioles than on the vocal cords. In theory the procedure sounds difficult but in practice it is not so. If any one watches us doing it, one realises one can repeat it oneself easily.

In this exercise we sit on a chair or preferably squat in the oriental fashion with the legs crossed one over the other. We contract the bronchioles, the abdominal muscles and the glottis and exhale gradually as in a paroxysm. We give the start by exhaling as in Ujjayi. Our prescribed exercise is for asth-



matics. Knowing only too well what a paroxysm is, they can do it correctly and faithfully. In their case the question of the possibility of constricting the bronchioles does not arise, since they are being tortured in their illness by this phenomenon. Their mere suggestion is enough to produce this at once. In the classical Bhastrika we contract the anterior abdominal muscles at a quick rate. Here we do so as slowly as in a paroxysm. Therefore we mimic asthma in every detail, but we do so at will and therefore feel no difficulty during the exhalation, especially because we contract the abdominal muscles forcibly.

There is another very important difference between a paroxysm and our exercise. In asthma the normal volume of air is not sent out of the lungs ; there is a fair amount of residual air left behind. But here we expel more than the usual volume of air and therefore the question of emphysema resulting from this exercise does not arise. In asthma emphysema is bound to be a sequela if proper breathing exercises are not taken.

After a complete expiration we inhale in the ordinary way ; we do not keep the glottis or the bronchioles constricted. We now retain the breath for as comfortable a period as possible, and exhale in the ordinary way. Therefore one round is composed of the author's exhalation, normal inhalation, normal retention and normal exhalation. We may take one or two normal breaths before the next round. Three rounds are enough for a sitting.

At the end of the exercise we feel that all the organs in the abdomen and chest are massaged exceedingly well ; flatus passes out freely in the early stages. Digestion is greatly improved ; the heaviness in both the abdomen and chest disappears. Breathing becomes normal, and cough is no more.

The *rationale* of the exercise is obvious in the light of the explanations given in the earlier chapters. It combines the principles of both Ujjayi and Bhastrika. The respiratory centres and the two vagus nuclei are brought under increased control, deliberately by will. The receptor-terminals of the vagus in the lungs and bronchial tubes are stimulated by the forcible expiration, the following deep inhalation and Kumbhaka, and these impulses are carried up the vagus, and as stated in the Preface produce pituitrin secretion.

During this exercise, as in all strenuous ones, there should be nothing tight round the waist ; the upper border of the veshti or trousers should be brought down ; the entire abdomen and chest should be devoid of clothing. It should be done on an empty stomach early in the morning. If done at other times at least six hours should elapse after the last solid meal.

From the above it is clear that the upstroke of the diaphragm caused by the contraction of the anterior abdominal muscles is just one for a round. Here we exert the same force on the abdominal viscerae as in Bhastrika



but each stroke is done slowly and gradually taking about 10-20 seconds. In Bhastrika the number of strokes or exhalations is 20 or more for a round; and the bronchioles and glottis are wide open right through the round. Here during the first exhalation they are both constricted, but during inhalation, retention and the last exhalation they are wide open.

In the Chapter on Bhastrika (*i.e.*, 3rd Chapter) we have already suggested that during exhalations the glottis may be slightly constricted. In the present exercise we constrict the glottis, bronchi and the bronchioles to a maximum during the first exhalation of a round.

In the case of *children* three or four big rubber balloons of different shapes are placed in their hands and they are asked to fill them with air by exhaling through their mouths to their utmost capacity. They willingly do so and like to repeat it many times during the day. This should be encouraged. The purpose of variety in shape is only to attract the children. While they fill each balloon they are advised to do so in one or at the most two continuous exhalations, at the end of which a deep inhalation should be taken.

**Summary of Exercise :** Sit on a chair or squat in the oriental fashion.\* Start breathing out with the vocal cords approximated,

\* Some asthmatics need a moderate inhalation before they start exhaling.

as in Ujjayi, and continue to contract the bronchi, bronchioles and abdominal muscles, as in a paroxysm forcibly. After such an exhalation inhale in the ordinary way (*i.e.*, with the glottis well open). Retain the breath for a comfortable period and exhale in the ordinary way. One round is completed and it is composed of the special exhalation, normal inhalation, retention and normal exhalation. Three rounds for a sitting; few seconds of rest between 2 rounds. Time: 3 minutes.

## B.

There is another very easy exercise purported to stop the cough and desensitise the asthmagenic area below the glottis. Here we make a series of to and fro movements of the breath in the larynx almost as in Bhastrika till we cough no more. This should be practised whenever there is a tendency to cough. This exercise may be done at any time anywhere. When alone it may be done for a few minutes daily. As mentioned in Chapter III the forcible expiratory current of air through the larynx inhibits the expiratory centres. This powerful current of air, though primarily focussed in the larynx, travels up and down the entire respiratory passage. Therefore the inhibitory action on the cough is great.



## CHAPTER VI.

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### RAISING OF THE DIAPHRAGM OR UDDIYANA.

This exercise is done either standing or seated, *vide* Plate 7. We shall describe it as it is done in the seated posture. We squat in any comfortable way with the legs crossed one over the other and the hands placed on the knees. We now exhale deeply watching the strong contraction of the abdominal muscles. The spine is kept erect with a slight bend forwards. At the end of the expiration, we press on the knees with our hands firmly and fix up the neck and shoulder muscles by contracting them vigorously. At the same time we raise the ribs as in an inhalation but without opening the glottis and simultaneously we relax the abdominal muscles. Since the air is not allowed to go into the lungs the diaphragm is drawn upwards and the anterior abdominal wall goes upwards and inwards forming a concave depression. When we no longer can hold the breath out comfortably we inhale gradually, simultaneously relaxing the neck and shoulder muscles. This forms one round. We advise two rounds only for a sitting. If overdone it will cause pain in the chest wall and stimulate the expiratory centre too much.



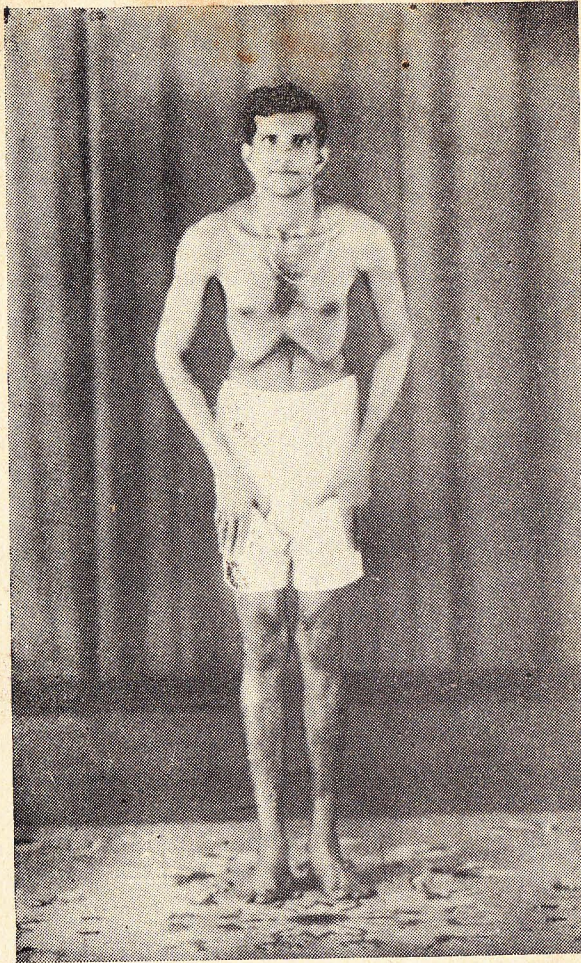


PLATE 7.

Uddiyana.

The beginner may find it easier in the standing posture. The Plate describes it. The chest is bent forwards. Incidentally the leg and thigh muscles are also exercised in this posture.

In this exercise the diaphragm goes up even higher than in Bhastrika (*vide* Chapter III). The Sanskrit word uddiyana means *raising up*.

X'ray photographs show the rise of this big sheet of muscle into the chest. It necessarily massages the heart and lungs in a way in which no other exercise can. The liver also is massaged and in general all the organs in the abdomen.

In ordinary inspiration the intercostal muscles (*i.e.*, muscles of the chest wall) and diaphragm take part, while in forced inspiration the following muscles of the neck and shoulder, *viz.*, sternocleido-mastoid, trapezius, serratus magnus, pectoralis major and pectoralis minor also take part. We normally control these muscles and the various nerves that supply them. But there is a further control exerted on the vocal cords, through the laryngeal intrinsic muscles, which are supplied by a branch of the vagus nerve, the right cord by the right vagus and the left cord by the left vagus. Under the strenuous conditions that obtain in Uddiyana we control the vocal cords and therefore we increase our control over the vagus. We keep the diaphragm, the two phrenic nerves and lower intercostal nerves that supply it in complete



abeyance. In other words we inhibit all impulses that travel along these nerves. Inhibition signifies control. We inhibit these impulses during the mock inhalation, *i.e.*, when we raise the ribs with the glottis closed; that is normally a time when the diaphragm descends. Here we make the inhibition so effective that the reverse, though passive, action takes place, *viz.*, rise of the diaphragm. Therefore our control is all the greater. Incidentally, it must be noticed that the diaphragm is not raised by the abdominal muscles pushing up the viscerae, for the latter muscles are completely relaxed at this stage of the exercise.

When the inspiratory centre acts it makes the diaphragm, the intercostals and the other muscles of inspiration to contract. In this exercise we make all the inspiratory muscles except the diaphragm to contract. In inspiration the glottis is open but here we close it, *i.e.*, we stimulate the vagus motor nuclei. Therefore we order the inspiratory and vagus centres to do only what we want. This is why our control of the respiratory centres and vagus nuclei in this exercise is increased.

We have put this exercise late in the course since it is difficult. It is fraught with a little danger unless done under supervision. Those who have high blood pressure, cardiac, liver or stomach diseases should not attempt it on their own. The older ones especially those with much fat in the abdomen are advised to begin it under medical supervision.

Uddiyana should be done only on an empty stomach.

No one with hernia should undertake to do Bhastrika or Uddiyana. The hernia will necessarily get worse; but those who are threatened with inguinal hernia can prevent it entirely by these exercises if they are done under medical supervision and advice. These exercises strengthen the abdominal muscles, fasciae and ligaments; the apertures, through which the hernia develops, get closed. This is especially noticeable in the young.

The control we attain is, of course, through the respiratory and vagus centres. Our will works through the cerebrum on these centres. Children of ten learn and practise this exercise well without any difficulty. In Yoga only those above 13 are exhorted to practise these exercises; but as a therapeutic measure children of 10 can practise them without the slightest harm to themselves. On the contrary they benefit by them definitely.

Those who have become proficient in Uddiyana like to repeat it a few times. They may with advantage do so (say 4 or 5 times) if they perform at the end of Uddiyana a deep inspiration, and Kumbhaka at the end of it. This modification of the classical exercise stimulates the inspiratory centre more than the expiratory centre. This is essential for the cure of asthma.

There is another great value in Uddiyana. The sudden powerful upstroke of the dia-



phragm stimulates the pulmonary plexuses of nerves, which have the components of both the vagus and the sympathetic. Therefore this exercise gives a new strength to the bronchi and the lungs. As mentioned in the Preface it also stimulates the flow of pituitrin into the blood.

**Summary of Exercise :** Squat with the legs crossed or stand with a slight bend of the chest forwards as in Plate VII. Exhale deeply and at its end press on the knees with the hands firmly and fix up the neck and shoulder muscles by contracting them vigorously ; at the same time raise the ribs as in inhalation, but with the glottis closed and relax the abdominal muscles. When Kumbhaka can no longer be maintained inhale gradually, simultaneously relaxing the neck and shoulder muscles. At the end of the inhalation we advise Kumbhaka for asthmatics. One round is thus completed. Two rounds for a sitting, with interval of a few seconds between rounds. Time : 3 minutes.

## CHAPTER VII.

### SUNBATHS.

#### ALTITUDE.

It is indeed most deplorable that the value of sunlight is not sufficiently recognised by the medical profession of Ceylon and Great Britain. In the latter country street lamps have to be lit even by day during winter. Sunlight is so scarce and therefore it is pardonable that most of the doctors in Great Britain do not know enough of the therapeutical properties of sunlight.

The rich amongst us go to Switzerland for the cure of Tuberculosis. All that is done there is to expose the body in a graduated way under medical supervision to the healing influence of the sun's rays. Big tubercular ulcers in bones are easily cured by this means. Not a drop of medicine, not even cod liver oil, is used in the course of treatment.

But for the sun, life on our planet will be extinct ; and yet how many of us realise its significance. The sun's rays play a very great role in the maintenance of the various processes of life. The various foodstuffs are manufactured in plants by the action of sunlight on chlorophyll in the presence of carbonic acid. The solar energy is converted into the potential energy of vegetable food.



It is a well-known fact that the symptoms of any illness increase after sunset. The action of sunlight on micro-organisms is demonstrable. Tubercle bacillus when expectorated and kept in a test-tube can live for some weeks, but when exposed directly to sunlight is killed within a few minutes at the most. The fact that bacteria in the upper layers of the skin are killed by sunlight is accepted by all. On account of this bactericidal power many chronic skin diseases are either cured or helped greatly in their cure. Sunlight tones up the skin and prevents certain skin diseases.

According to modern medicine the ultra-violet rays of the sun form the healing factor in sunlight. We can benefit by direct exposure to the sun's rays and also to the skyshine. The ultra-violet rays are diffused and reflected in the sky and the value of the skyshine is not a little. For direct exposure to the sun there should be enough ultra-violet rays. It has been shown that the angle of inclination of the sun must be greater than 35 degrees before any ultra-violet rays get through. There is also the heat of the sun to reckon with. Exposure to the sun when it is very hot is not good for an invalid. Therefore exposure between 7-30 and 8-30 in the morning and between 5 and 6 in the evening is suggested. These hours have to be varied to suit the times of the year and the climate of the place concerned.

*When ultra-violet rays impinge on the skin vitamin D is formed* (Steenbock). In the deeper layers of the skin ergosterol is present. This

substance is converted into vitamin D by the sun's rays or ultra-violet rays. In the same way vitamin D is prepared in the laboratory by exposing ergosterol to ultra-violet rays. This vitamin is essential for the assimilation of calcium by the bones. The Muslim mothers of Kashmir are used to purdah and are notorious for not exposing themselves to the sun even by chance. They, as a result, suffer from a disease called 'osteomalacia.' Here the bones do not assimilate calcium and therefore the pelvic bones bend and get deformed. Child-birth through a deformed and crooked pelvic canal becomes impossible.

In infancy there is a similar disease—rickets. Here also there is a poor assimilation of calcium by the bones, and therefore the bones bend. Lungs get weak and bronchitis is common. Digestion is upset and there is pot belly. Even the kidneys are affected, all these defects are cured by giving calcium and vitamin D.

Exposure of the infant to the sun takes the place of vitamin D completely. A few minutes' daily exposure to the sun is recorded to cure rickets in 2 to 3 weeks !

The green plant is the source of many vitamins. This is due to their constant exposure to sunlight. Animals eat them and store them in their organs. Their milk is rich in them especially vitamins A and D. The butter churned out of this milk is therefore rich in these vitamins. Fishes feed on



green plant organisms in the sea. Their livers or those of big fishes which eat smaller fishes which eat green organisms are rich in vitamins A and D. Hence is the value of cod liver oil or shark liver oil.

Now it is clear from the above that exposure to sunlight does one a world of good. How long should one expose oneself is the next question. First and foremost there must be no fear. Our farmers are exposed to the sun practically the whole day; and how healthy they are. But, however, those who are not used at all to exposing themselves to the sun are advised to do so gradually. For a start they might expose the 2 feet for 10 minutes. Later the 2 legs, up to the knees, for 15 minutes. Later, up to the hip for 10 minutes. This must be done for some days. The exposure can now be extended to the chest for 10 minutes at a time; after some time the whole body up to the neck should be exposed for the same period of time. The body must get quite used to this exposure. This should be done twice a week and later thrice a week. After some weeks the whole body should be exposed for 10 minutes at a time. In the Alps, where it is very cool, Rollier starts with the feet for 5 minutes and in 2 weeks exposes the whole body for 3 to 6 hours. The above is only a rough sketch of the graded system of exposure. The length of time should be increased gradually to half an hour in the Tropics and 3 hours in the Temperate climates. There should be no kind of covering during sun-bath. The

ultra-violet rays penetrate better if there is nothing oily or greasy in the skin. Therefore whenever possible a bath or wash with soap is advised before the exposure. Specially sensitive people must however do the sun-bath under medical supervision.

‘Studies on the so-called functional skin diseases, *i.e.*, the disorders in which no organic cause can be found and where it is assumed that a pre-natal lack of stability of the sympathetic nervous system is one of the responsible causative factors, have shown that generalised daily ultra-violet irradiation or sun-baths is one of the best means for building up nervous resistance. The beneficial effect on the sympathetic nervous system is notable.’ (Becker and Obermayer). We have studied in the first Chapter that the contraction of the bronchial muscles produces an asthmatic paroxysm. These same muscles are also supplied by the sympathetic nervous system, but stimulation of these nerves causes dilatation of these muscles. Adrenalin, when injected, acts in the same way as stimulation of the sympathetic nerves concerned. Both cause immediate relaxation of the muscles and therefore the paroxysm ceases.

This seems to account partly for the good effects of ultra-violet rays of the sun on an asthmatic patient. The effects of the white light of the sun, *i.e.*, that part of the light between infra-red and the ultra-violet on our bodies are hardly known to modern medicine.



Soon after a sun-bath one is struck by the volume of flatus passed. This alone relieves much distress by removing the pressure on the heart and lungs. The warming of the chest and the rest of the body by the sun visibly decreases the paroxysm. In fact when one has high fever, *e.g.*, malarial as a complication in asthma, the paroxysm as a rule disappears during fever. Sonne of Copenhagen advances the view, supported by his experiments, that the luminous rays of the sun heat a very essential portion of the aggregate blood-volume to a temperature possibly exceeding the highest fever temperature ever measured without causing the body temperature to rise in any appreciable degree.

The effect of sunlight on the chemistry of blood is surprisingly great. The phosphorus content of an infant's blood is found to be doubled in a fortnight by the daily exposure of the infant to the sun. Calcium and iron in the blood are increased. The iodine content of thyroid is also increased.

H. H. Dale found that smooth muscle can be made to contract by ultra-violet light. This shows that sunlight has a tonic effect on the smooth muscle. The bronchial muscles are smooth muscles and are probably toned up by sunlight, though at present scientists say that the ultra-violet rays cannot penetrate so deeply. It is recognised that tanning of the skin by sunlight is an important step in the production of healthy effects on the body. Saleeby is of opinion that underneath the

tanning there is much information that has yet to be found by research; Rollier of Leysin, who is the father of Heliotherapy in the West, believes that tanned skin converts the ultra-violet rays into red rays which penetrate the whole body. Leonard Hill has done much research work in Heliotherapy and has come to the following conclusions: 'The general ultra-violet radiation of the skin puts up the bactericidal power of the blood. The ultra-violet rays penetrate to, are absorbed by, and act on the cells of the epidermis; these rays produce alteration of electrical charge resulting in changes in the aggregating colloidal contents of the living substance of the deep epidermic cells, and, in consequence, there follows erythema, increased exudation of lymph and white corpuscles. The visible rays pass through and do not affect the epidermis, but are absorbed by the red colour of the blood and locally warming that up to a relatively high temperature, excite erythema and accelerate reactions in the living substances, whatever they may be.'

Percy Hall in his book "Ultra-violet Rays in the treatment and cure of Disease" describes the good effects of these rays on many diseases. He gives plenty of instances extolling the beneficial effects of these rays even in old-standing cases of asthma. Where an asthmatic is sensitive to proteins, he is of opinion that actino-therapy gradually desensitises the



patient through successive mild "protein-shock" reactions of the absorbed products from the repeated skin erythemata.

We have observed that when ultra-violet rays are thrown on the chest of an asthmatic during a paroxysm, the latter is either stopped or greatly reduced in severity. In the case of babies we found that regular long sunshine baths in the open not only cure the asthma but entirely eradicate it from the system. In South India, practically every house has a terrace. It provides a fine place to take sun-baths from. In hyperpiesia ultra-violet rays reduce Blood Pressure.

In a certain proportion of asthmatics an eczematous rash is present, and it is commonly known that when this eczematous rash intervenes in such cases asthma disappears and *vice versa*. Sunlight, as we have studied previously, is an excellent healer of such rashes and tones up the skin to normality. The increase of calcium in the blood caused by sun-baths not only removes such skin-lesions but also prevents them.

### Altitude.

High altitudes (over 3,000 feet above sea level) do much good. Hurst, Longdon Brown and Hilton give great importance to this. According to Hurst, residence at heights of over 4,000 feet make 90 per cent. of asthmatics lose all their symptoms within a short period. Only chronic asthmatics get a relapse on return to

the plains. Asthmatic pilots confirm this. The exact cause is not known. Dust proteins, pollen, etc. may be less in such high altitudes; fresh ozone may be a cause just as the ozone of the sea suits some asthmatics. High altitudes have undoubtedly a soothing effect. On a warm day in the Tropics, a flight to a height of 10,000 feet immediately cools and soothes our brains. Those who like meditation always look forward to such flights. The temptation to meditate is insistent at such heights. The irritable vagus nucleus must necessarily share in the soothing process. The cerebral centres have a powerful control over the lower centres. When the former are soothed the (lower) vagus centres are also soothed. It is in this way, probably, that Faith-cures are also effected. The great Faith stills the cerebral centres.

However, it must be made clear that an asthmatic should not do anything that may precipitate a paroxysm, *e.g.*, cleaning the nasal passages by drawing in hypertonic salt solution or getting wet in the rain. High altitude is not proof against similar commissions of error. This may be the reason why in the experience of some authorities good results were not observed.



## CHAPTER VIII.

### A.—Exercises for General Health and Asthma.

When a person, especially an elderly one, sticks only to these breathing exercises, he might develop a stiff spine. We must on the other hand keep it supple. To do so any bending exercises of the school drill type may be practised. For example, one may raise both arms above the shoulders and bend forwards to touch the toes with the hands. Expiration is performed during bending and inspiration during the rising. It may be variegated by touching the right foot a certain number of times (say 10) and the left foot an equal number of times.

The muscles of our limbs are not much affected by our breathing exercises. Brisk walk for the aged and running or skipping for the young are suggested.

There are quite many systems of indoor exercises, *e.g.*, Indian gymnastics, Sandow's system, Muller's system and the like. If one is used to one or more of these one should not give up such practices. Exercises with clubs or boxing or wrestling may be practised. Outdoor games like tennis, cricket, soccer, volleyball should not be given up if one is used to one or more of them. There are many Yogic



asanas or postures which may be also practised with special advantage. The Plates show 5 valuable Yogic exercises, *viz.*, Sarvangasana, Matsyasana, Sirshasana, Nauli and Ardha-Matsyendrasana. Where chronic asthmatics have not derived sufficient relief from the exercises given in the foregoing pages, they are strongly advised to study this Chapter and learn to practise these, especially *Matsyasana* and *Sirshasana*.

### Principles of Yogic Exercises.

In presenting these Yogic exercises a few words of introduction are necessary. A most notable feature in all Yogic asanas is the exercise of *movement of the vertebrae of the spinal column*. From the spinal cord, which is situated inside the neural canal of the vertebral column, the spinal nerves proceed on either side through foramina to the various muscles and organs. The slightest dislocation or displacement of the vertebrae causes a chronic or acute pain in the muscles supplied by the nerves affected by such displacement. There must be a certain amount of mobility between the vertebrae. If by force of our sedentary habit or otherwise the mobility is decreased then we cannot bend forward with ease, *e.g.*, lumbago. It is absurd to give drugs for such affections. The vertebrae concerned should be put back into proper position and exercises of vertebral movements should be prescribed. The following example illustrates it: A young lady from a distant town consulted us for a wry neck. She could not keep the face straight; it was

tilted to one side. For three months she had taken medicines from six medical men, both ayurvedic and allopathic. In less than three minutes we put her right by moving the displaced vertebrae into correct position. This is called osteo-pathic treatment. This system claims the cure of such serious diseases as diabetes. Nerves proceed from the spinal cord to the autonomic nervous system and thence to the organs. The osteo-path puts the vertebrae into proper position and enables the tonic and trophic impulses to proceed to their destination undisturbed. In these Yogic exercises the student learns how to keep all the vertebrae in proper position and mobility. A certain class of diseases is prevented and those who suffer from them are cured. This shows how the weak organs become strong. Hydrocoele is cured or reduced by these exercises whereas in allopathic medicine only surgical cure is possible. Weak testes and ovaries become strong. Sterility, caused by weak ovaries, is recorded as having been cured. Even atrophied testis have regained fresh growth.

### The Rationale of the Block in the Spinal Nerves.

In the spinal nerves there are fibres of both the central nervous system and the autonomic nervous system. In these some are afferent fibres, *i.e.*, they carry sensations. When there is the slightest pressure on these fibres caused by displacements of the vertebrae or otherwise there is pain. This pain inhibits the



reflex impulses which normally pass between the brain, spinal cord and the various organs. In ordinary life this phenomenon is well known, e.g., when there is acute pain in the stomach one does not feel hungry; nor is one inclined to receive a friend or write a poem in that state, the reason being that the pain inhibits all these fine impulses also.

The afferent impulses pass into the spinal cord and brain through the afferent fibres in the spinal nerves from the various structures of the body. If a displacement of one or more vertebrae can cause pain or discomfort, it means that that displacement presses on those spinal nerves. So, the efferent fibres of those spinal nerves are also pressed upon. This pressure *per se* causes impulses of pressure-injury to pass along these efferent nerves.\* When such impulses are travelling along these fibres the normal tonic impulses cannot pass along these same nerves properly or in the normal frequency. Therefore the structures which they supply suffer. A common example may be cited to show this. If we ask a few persons to stretch their arms and hands and hold them together in front, some of them show a fine tremor, while the others are steady. If these, who show the tremor, take the necessary steps to exercise the lower cervical and upper dorsal vertebrae, the tremors disappear, whereas any amount of exercises merely for the

\* When a constant current of small voltage is passed through a nerve, it is found in the region of the anode the nerve is unexcitable.

muscles of the arms and hands will not remove the tremors. When the skin over the intervertebral foramina in asthmatics is deeply palpated it is a common experience to find a little but definite tenderness over the upper Dorsal area with its maximum intensity over the 5th Dorsal. *This shows that the lung and bronchiole reflexes are affected.*

The lay readers require a few words of elucidation of the word 'tonic' as used in physiology. Our muscles, for example, are not flabby and loose as in the case of one who is just dead. They are in our waking consciousness in a slightly contracted state, as if it were, ready for action. When an athlete is about to start on a 100 yards dash he keeps his body in just a sufficiently tense state to take off easily and quickly. So also, in normal life all the muscles are in a 'tonic state.' The absence of this 'tone' is exemplified in the affected muscles in lower motor neurone paralysis.\*

The back-muscles concerned in the movements of the vertebrae and the various ligaments of these vertebrae are strengthened and developed by these exercises. This development ensures the prevention of any further displacements of the vertebrae. Necessarily the circulation of the blood in the spinal cord is greatly increased. In *Sirshasana*, *Sarvangasana* and *Viparitha karani* the circulation

\* For further information on 'tone' vide Chapter X under 'Prana-maya-kosha,' Pages 167-168.



of the blood in the brain is tremendously enhanced. The value of an excellent blood circulation to the nervous system can be gauged by the fact that if the brain is deprived of blood for seven minutes the nerve cells die irrevocably. The cells of the spinal cord can stand the loss of blood supply for a longer period (45-60 minutes).

There is another great value in these Yogic exercises. *The cerebro-spinal fluid*, which is about 150 ccs. in volume, circulates at a pressure of 120 mms. water, through the centre of and around both the spinal cord and the brain. This fluid which is secreted by the choroid plexuses gives nutrition to, and removes the waste-products from, all the structures which it bathes. The vagus centre lies almost adjacent to this fluid in the fourth ventricle. The respiratory centres lie a little deeper in the medulla. *All the Yogic exercises mentioned in this Chapter especially the above three increase the circulation of this fluid.* This fluid drains into the venous blood and to a less extent into the lymphatics. Disease of the brain or spinal cord is indicated in this fluid. For example, a tuberculous infection is shown up by the presence of a large number of lymphocytes in it. Therefore it is reasonable to say that a healthy freely moving cerebro-spinal fluid definitely exerts a healthy influence on the vagus nucleus and other centres.

It must also necessarily tone up the entire brain, spinal cord and their nerves. Therefore the cells of the body, where an inborn

error of metabolism is present, will tend to become normal under this 'tonic' influence.

There are two sympathetic chains, one on each side of the vertebral column. Each chain looks like a veritable rosary. The beads are the sympathetic ganglia and fibres from the spinal nerves go to these ganglia. The Yogic exercises increase greatly the blood circulation to these ganglia, the spinal cord and its nerves. The various spinal movements exercise the spinal cord and keep its nerve cells and nerve fibres in a perfect condition. The sympathetic, in the same way, is kept perfectly fit.

When the nutrition of the nerves is impaired much, stronger electrical currents are necessary to evoke muscular contractions than in the normal state. *The Yogic exercises increase the circulation of both the cerebro-spinal fluid and the blood.* Therefore the nutrition of the nervous system is greatly improved and therefore the normal impulses will pass through with greater ease than before the practice of these (Yogic) exercises.

If Sirshasana and Sarvangasana are maintained for a certain period the cerebro-spinal fluid, by sheer force of gravity, will fill up the ventricles (*i.e.*, cavities inside the brain) at a greater pressure than before. When Sarvangasana is maintained for a long time, the pressure particularly in the fourth ventricle is increased and the vagus centres tend to be stimulated. Therefore this results in an in-



crease in asthma. It is for this reason that during periods of illness an asthmatic is not advised to do Sarvangasana for more than 2 minutes at a sitting. In the case of Sirshasana the lateral ventricles and the 3rd ventricle are filled up at a great pressure. In Matsyasana also this takes place.

The 3rd ventricle sends a recess into the posterior part of the pituitary gland, which secretes pituitrin. This internal secretion is poured into the cerebro-spinal fluid. In asthma we inject adrenalin and pituitrin together for more effective sympathetic action (*vide* Plate 8).

Therefore if *Sirshasana* is maintained for many minutes the sympathetic is stimulated. These two facts can be verified by an average asthmatic, *viz.*, that Sirshasana, when maintained for many minutes decreases the asthma, while Sarvangasana maintained for many minutes tends to increase the asthma. The following clinical case also exemplifies it: "A young man of thirties is subject to a severe allergic eczema. His father is a chronic asthmatic. He began doing Sarvangasana for long periods at a sitting after having given them up for some years. He developed eczema to a much greater degree than before and more frequently. His mistake was shown and he benefited greatly by decreasing the time devoted to Sarvangasana. It is useful to know that he never had asthma before." He was taught Ujjayi also. Within a few days there

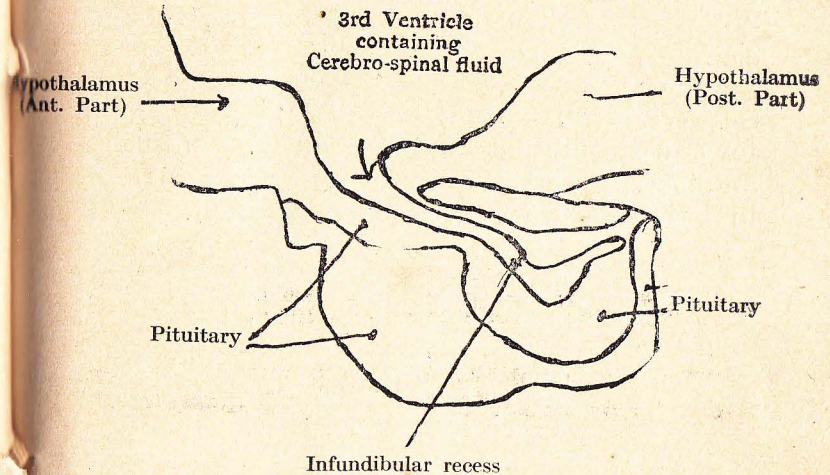


PLATE 8.

### The Third Ventricle and its Infundibular recess into the Pituitary.

This recess, which is present early in the human foetus, for the most part filled up by pituitary substance.

- (1) The intimate connection between the Cerebro-spinal fluid and the Pituitary gland.
- (2) The Hypothalamus, which contains the head centres of the Sympathetic and Para-sympathetic nervous systems.



was not even the tendency towards eczema formation. Before the practice of Ujjayi he noticed that the skin was not normal, though eczema-free.

When an asthmatic takes Sarvangasana for say 15 minutes at a stretch, he will notice an increased secretion in the nose and difficulty in breathing during the exercise itself.

**Sarvangasana** (Plate 9).—The name signifies that all parts of the body (Sarvang) take part in assuming and maintaining this asana or posture. It is indeed a wonderful exercise in the degree of benefit that accrues to one who practises it. It is easily done by children and young adults. Those who are past middle life must go slowly with it. A non-asthmatic may do this for 25 minutes with good results. However, at the start it should be done for 1 or 2 minutes; an asthmatic is advised not to exceed 2 minutes.

**Technique.**—Lie flat on the back over a hard bed covered with a thick bedsheet. Raise the thighs and legs till they make a right-angle with the ground; now raise the trunk slowly, supporting the pelvis with both hands, the arms and elbows resting on the bed. The trunk must finally assume the position shown in Plate 9; now the hands support the back; the chest presses against the chin and the thyroid is well massaged in between them. Those who are corpulent or old may raise the thighs, legs and trunk to an angle of  $45^\circ$  instead of  $90^\circ$ . Even this may take some days. In this position of  $45^\circ$  the asana is called *Viparitha Karani*.

**Benefits.**—The cerebro-spinal fluid suffers a great increase in its circulation. This fluid bathes the central parts as well as the external parts of the brain and spinal cord. An increase in its circulation signifies an all-round toning up of the entire nervous system. When we take a bath or wash how cheerful do we become. The nerve tissue is many times more sensitive than the skin. Therefore the hilarious feeling caused by an increased circulation of the cerebro-spinal fluid at an increased pressure on the nerve cells must be exceedingly great. The vagus nerve nuclei, are particularly stimulated. This is the reason why an asthmatic should restrict this exercise to 2 minutes.

The benefits of the milder asana, viz., *Viparitha Karani* are a little less. The circulation of the cerebro-spinal fluid is increased to a less extent than in Sarvangasana. The thyroid is not massaged in this, whereas in Sarvangasana it suffers a good massage.



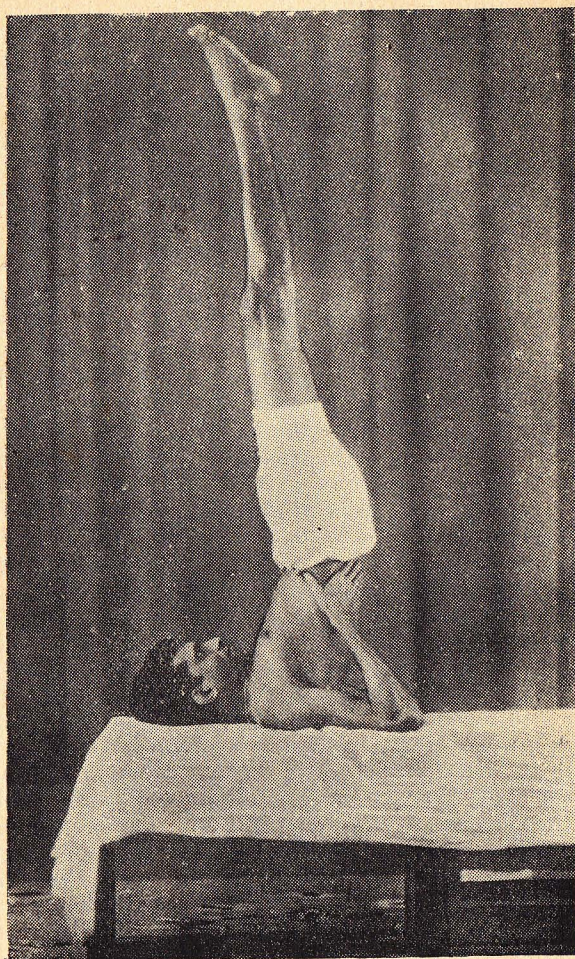


PLATE 9.

Sarvangasana.

Sarvangasana keeps the spine supple ; no other exercise is needed for this purpose. It is obvious that the thyroid gland is well massaged by this posture. Its arterial supply is increased. The gland is increased in its functional capacity within healthy limits. Its internal secretion is all important for the well-being, tone, proper metabolism, and growth of the body. The larynx is massaged and the asthmagenic area below the glottis is exercised and becomes normal. The sympathetic and the entire spinal cord are toned up. The blood supply to the chest and its organs is increased. Varicose veins, haemorrhoids and varicocœle tend to disappear. The kidneys are massaged so well that they function in a way that one has never experienced before. The beginner may pass water so often as to wonder if he has developed diabetes. The congested testes and ovaries lose their congestion and become normal. The sexual potency is definitely increased. The old man begins to feel young. Gastro-intestinal disorders also decrease or disappear, *e.g.*, constipation. Without an instructor one can do this exercise. The breath is allowed to take its natural course. Almost all the muscles of the body are exercised by this asana. \*3 minutes of this exercise raises the systolic blood pressure from 125 to 135 mms. Hg.

Time : 15 seconds to 2 minutes.

**Matsyasana.** (Plate 10).—In Sanskrit 'matsya' means fish. It is so called because in this asana one can float on water for a long time, even as a fish, without swimming.

**Technique.**—Spread a sheet on a hard bed, and sit on it with the legs stretched. Bend the right knee joint and place the right heel on the left hip-joint. In the same way bend the left knee and place the left heel on the right hip-joint. This is Padmasana. Now lie on the back with the Padmasana touching the ground. Rest the elbows on the ground; lift the trunk and head and

\*5 minutes of 'clubs' and 'skipping' increased the B.P. of the same subject from 125 to 136. If more vigorously done the pressure in all exercises increases still more. After rest the pressure always resumes normality.



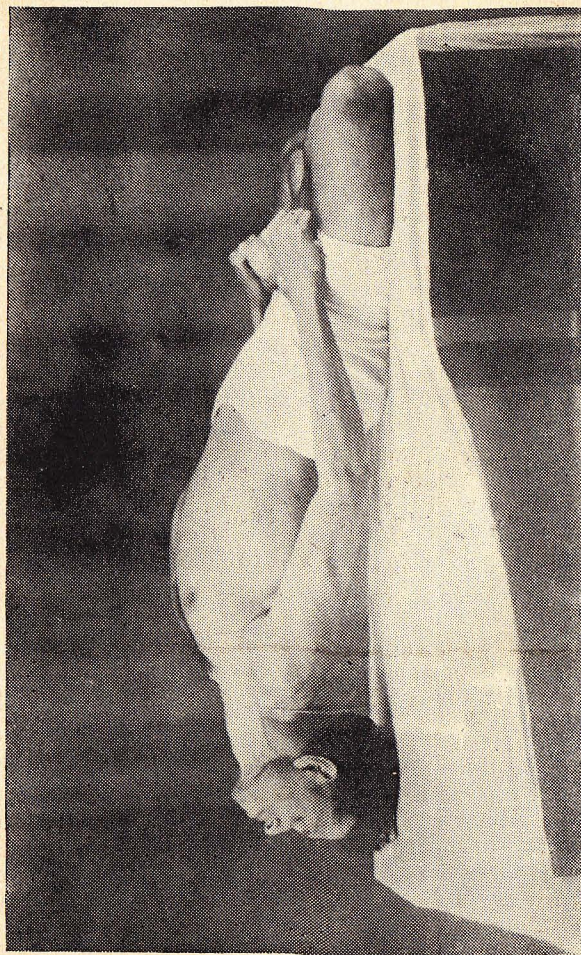


PLATE 10. Matsyasana.

rest the top of the head on the ground by bending the back well and throwing the neck well behind. Now catch the toes with the fingers.

Corpulent subjects need not bend the legs at the knees to the great extent shown in the Plate. They may flex to the most comfortable limit. It is easier to flex the legs behind the thighs than in front. This exercise is best performed after Sarvangasana. This bends the spine in the opposite direction, and stretches the neck instead of flexing it. The chest capacity is greatly increased and the respiratory tube is elongated. Breathing is allowed to be free and left to nature. The apices of the lungs, which are situated above and behind the collar bone are distended very well. It prevents tubercular lesion in this otherwise favourite region. Subjects after middle life are advised to practise *Viparitha Karani* instead of Sarvangasana, and then this exercise, in the modified way mentioned above for corpulent ones. An instructor is not necessary. If one sees it being done it is quite easy to repeat it. Needless to say these must be done on an empty stomach.

**Benefits.** The muscles of the waist, back and neck grow strong; and those of the two extremities, *viz.* arms and legs are equally well exercised. Since the thoracic muscles are strained in this asana those after middle life must go slow with the practice. In a confirmed asthmatic the curve of the thoracic spine is just the opposite of the one in this asana. Therefore this asana is an excellent rectifier of the asthmatic chest. It increases the vital capacity and the circulation of the cerebro-spinal fluid in the 3rd ventricle. Its beneficial effects on asthma are great. The bending of the vertebral column is a vital part of this asana. The thoracic and cervical sympathetic are toned up. \*In 3 minutes this exercise raises the B.P. from 125—80 to 135—94 mms. Hg.

**Time :** A little more than the time spent on Sarvangasana.

\* Of all these exercises Matsyasana raises the diastolic pressure most in comparison with the rise in systolic. Swamy Kvalyananda's figures, in general, support this.



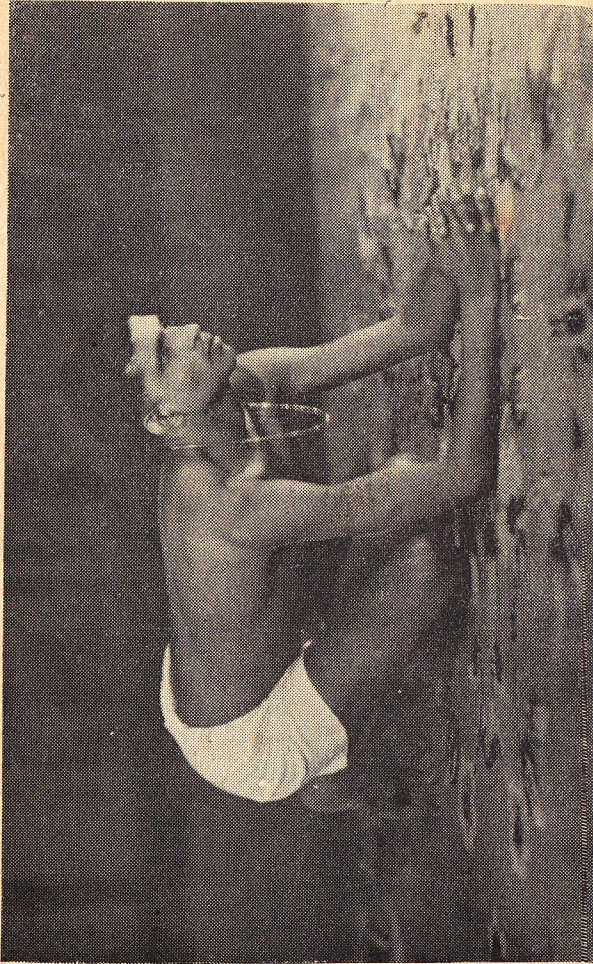


PLATE 11. Sirshasana, 1st Stage.

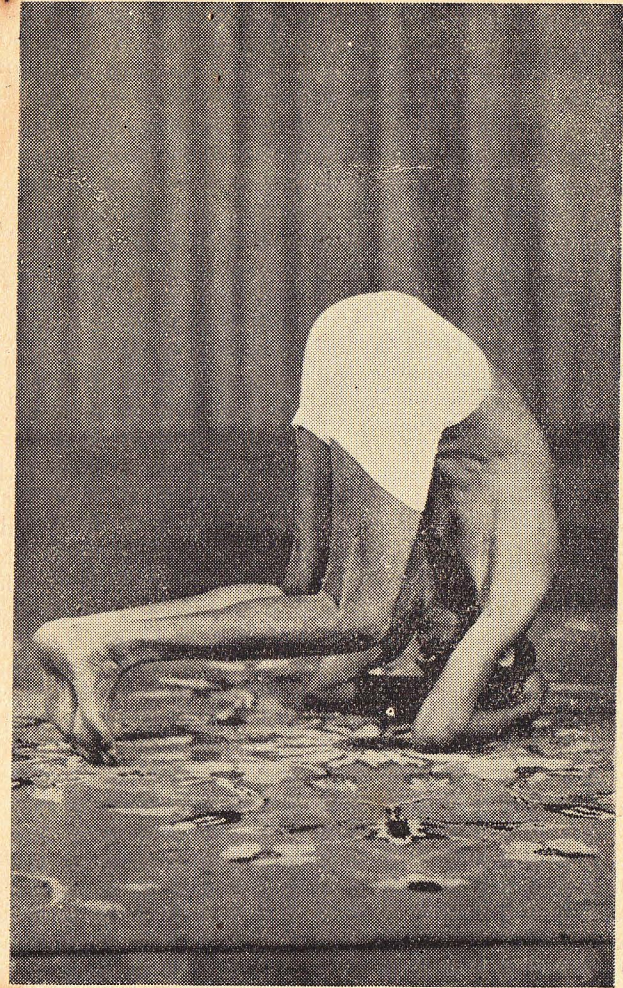


PLATE 12.

Sirshasana, 2nd Stage.

The weak ones may stop at this stage.



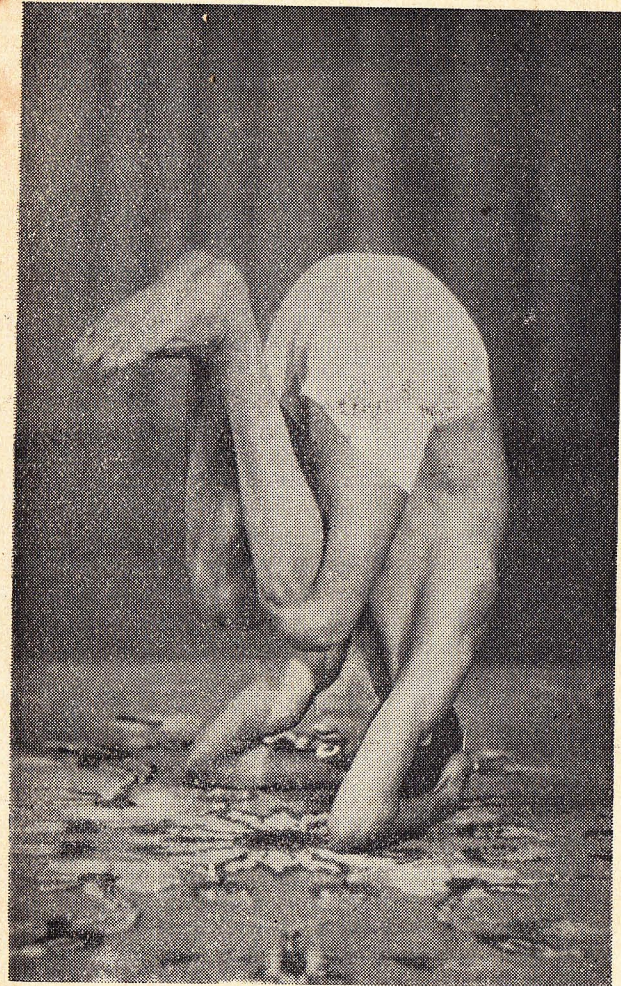
**Sirshasana** (Plates 11-16).—"Sirsh" in Sanskrit means head. The practitioner supports his entire body on his head. It is best that the intending practitioner consults a doctor as to his fitness to do it. For example those with high blood pressure should not attempt it. It should not be done without the help of an instructor.

**Technique.**—Spread a thick blanket on the ground. Sit on the knees, elbows and forearms and lock the fingers of one hand into the other (Plate 11). Place the head with the finger-lock pressing against the occiput (Plate 12). The pressure of this asana must be on the hind part of the head, the reason being that the spine must be erect during the balanced condition. Now as in Plate 12 slowly raise the trunk lifting up the pelvic part and try to hold it perpendicular to the ground.

In this process the knees are raised. When the trunk, supported on the head, is sufficiently thrown backward, the toes could be lifted from the ground easily. Now draw the knees to the chest, fold the legs, straighten the back and be firm in the balance in this position (Plate 13). Plate 14 shows an advance in the same stage. When this stage is mastered, straighten out (*i.e.*, extend) the thighs fully and bring them in a line with the trunk (Plate 15). Here the legs are flexed. Now extend the legs (Plate 16) and the entire body stands at right-angles to the ground. After a period ranging from 15 seconds to a few minutes, bring down the legs, etc. in the reverse order; *vide* Glossary under *vertebra*.

**Benefits.**—The circulation of the cerebro-spinal fluid is increased to a greater degree than in any other exercise. The good results of this increased circulation are depicted in Pages 94 and 97. The hefty ones may do Sirshasana till the 2nd stage (shown in Plate 12) is reached. There is sufficient benefit derived by doing it up to this stage. Increased nutrition of the brain improves the working of all the centres in the brain, *e.g.*, visual, auditory and olfactory centres, sensory and motor areas.

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**PLATE 13.**

Sirshasana, 3rd Stage.

( He is in process of raising his legs and straightening his back ).



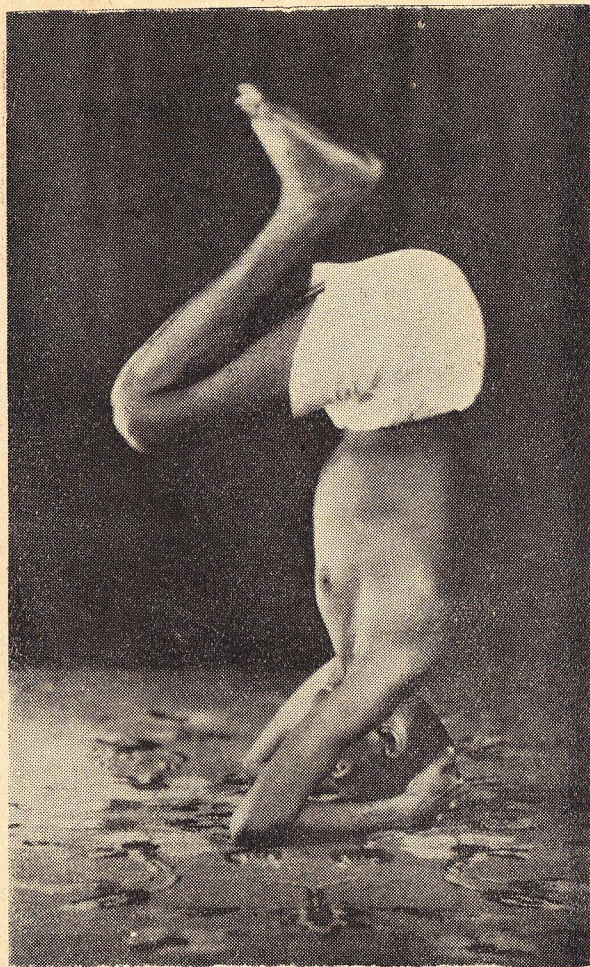


PLATE 14.

Sirshasana, 3rd Stage.

The back is straight.

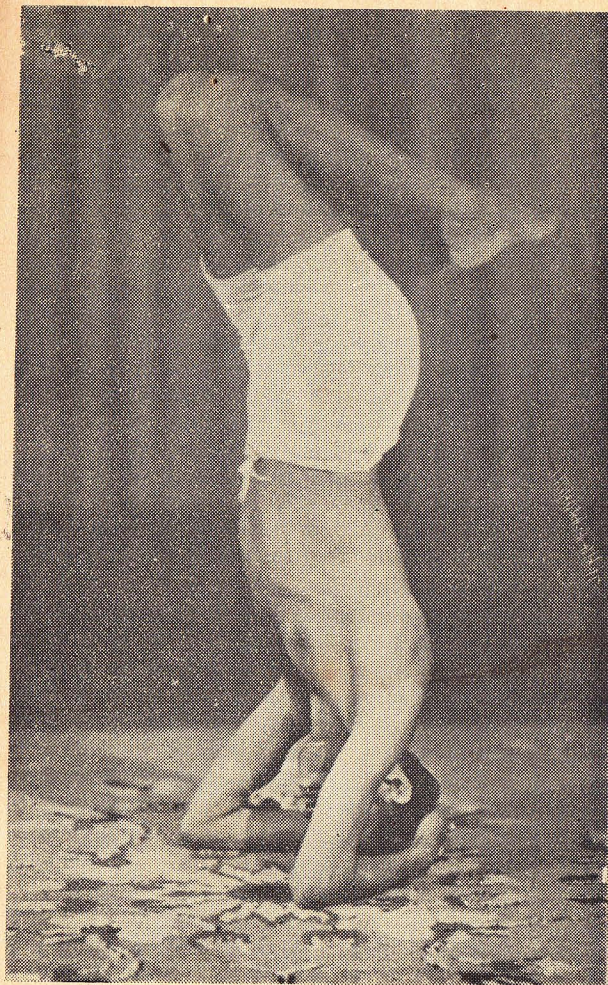


PLATE 15.

Sirshasana, 4th Stage.

(He has raised his thighs and is in process of raising his legs).



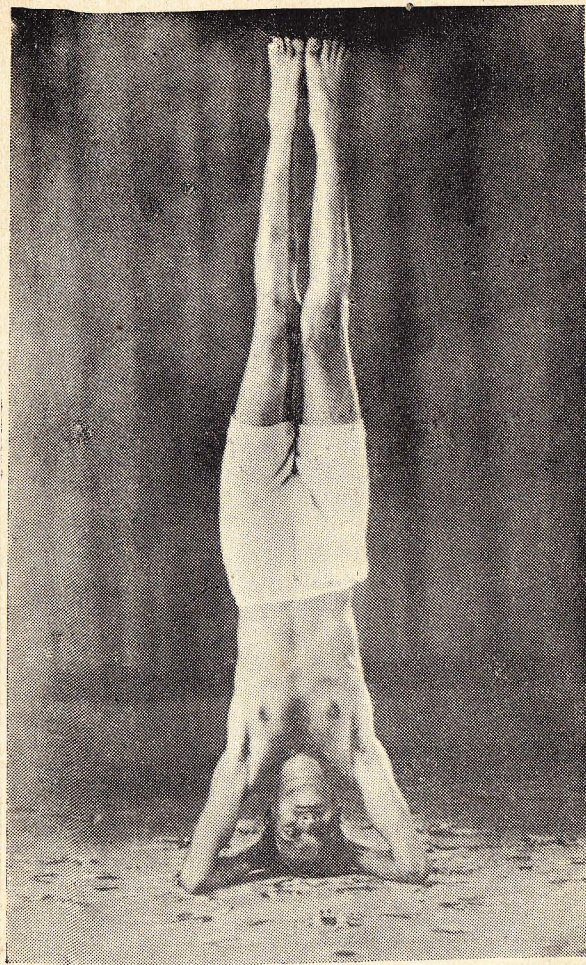


PLATE 16.

Sirshasana, 5th Stage.

The arteries of the brain cannot contract nor dilate as those of the rest of the body. It's (*i.e.*, brain's) blood supply is entirely dependent on the general circulation. Almost the entire venous blood enters the heart by the mere physical force of gravity. Therefore the heart pumps out more blood than before, with the result that the brain also receives its share of increased blood supply. The arterial blood also enters the brain to a greater extent on account of gravity. The superior vena cava and its tributaries do not drain into the right auricle as well as in our normal standing position. Therefore the brain will be over-flooded with blood, if the asana is maintained too long. One may faint under such conditions. We had 2 such cases from the Ceylon University. But with regulated practice, the intervention of the carotid sinus reflex prevents such accidents (*vide* Glossary); \* the Blood Pressure will not increase much.

If properly done it increases brain-capacity and memory power. Those who are addicted to masturbation and excessive wet-dreams will be greatly benefited. Sexual potency is increased. Since the venous blood is drained well, congestion in the liver, spleen, testes, ovaries, bladder, kidneys, pancreas and lungs decreases or disappears. Piles tend to disappear. The entire nervous system including the sympathetic, is toned up. Its sympathetic stimulation is of special value to asthmatics.

Time : 15 seconds to 5 minutes. This period may be increased under medical supervision for the purpose of asthmatics, for reasons given earlier.

**Nauli** (Plates 17 and 18).—In this act (*kriya*) uddiyana is first performed in the standing posture, with the chest bent forward. The anterior abdominal muscles

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\*The Blood Pressure of an eczematous patient (aged 26, height 5 ft. 6½ ins., weight 178 lbs.) before this asana was 114—84; after the asana, maintained for three minutes, the pressure was 120—80. The exercise seems to rectify a wrong pressure. Experimental evidence supports it.

The aortic reflex also intervenes to lessen the B.P. if necessary.



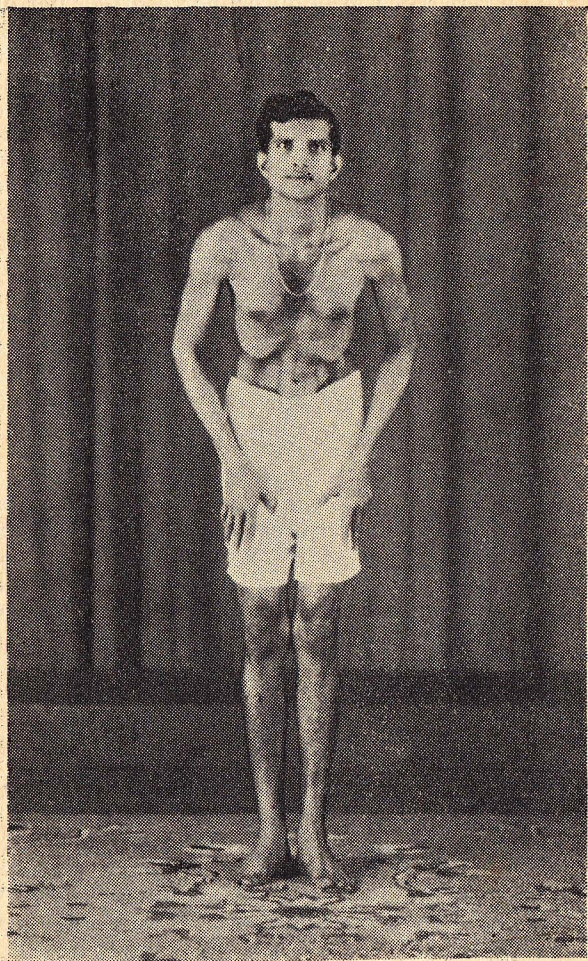


PLATE 17.

Nauli (1).

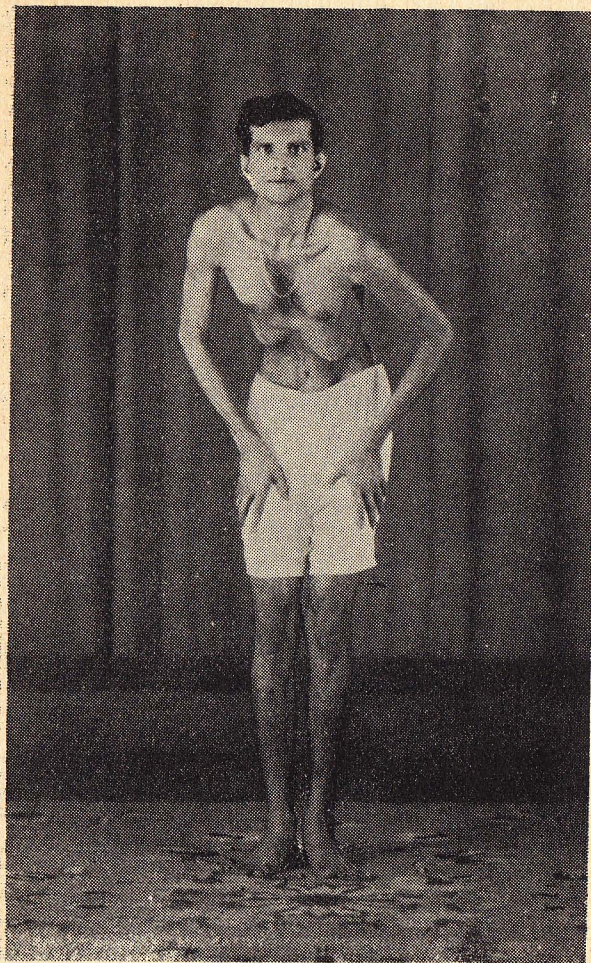


PLATE 18.

Nauli (2).



especially the recti are now worked. Plate 17 shows the recti well contracted and prominent in the mid line. They are now ready to churn the abdominal viscerae. Plate 18 shows the twin muscle moved to his left. In the same way the muscle can be moved to his right. When the practitioner works this muscle quickly the abdomen looks like a veritable churning mill. These individual steps are not then discernible. Necessarily the stomach, intestines, liver, spleen, bladder, and to a less extent the pancreas, kidneys, and adrenals (uterus and ovaries in the female) are well massaged. Constipation and dyspepsia disappear. An instructor is needed for this exercise. Those who are subject to hernia should not attempt it. This exercise should not be considered as a curative exercise for asthma. It is only given as an exercise for general health. There is the expected rise in B.P.

**Ardha-Matsyendrasana** ( Plates 19-21 ).—Matsyendra was one of the 18 great *Siddhars*. A siddhar is a full-fledged yogi, who has attained the 8 siddhis of yoga. Yogi Matsyendra gave a rather difficult asana for spiritual practice. The present asana goes to just half the extent of the original asana. Ardha means half. The main purpose of this asana is to give lateral rotation to all the vertebrae. It twists the spine.

**Technique.**—Spread a mat on the floor or a sheet on a hard bed, and sit on it with both the legs stretched out. Bend the right knee and press the heel against the perineum (Plate 19). Now raise the left thigh with that knee flexed and set its foot on the ground external (*i.e.*, to the right of) the right thigh. Pass the right arm over the left knee and catch hold of the left foot by the right hand. To do this, the left knee has to be set inside the right arm-pit; this action gives a powerful twist or rotation to the spine (Plate 20). Now swing back the left arm and catch the right thigh by the left hand and simultaneously turn the neck towards the left shoulder (Plate 20). The vertebrae are now forcibly rotated to

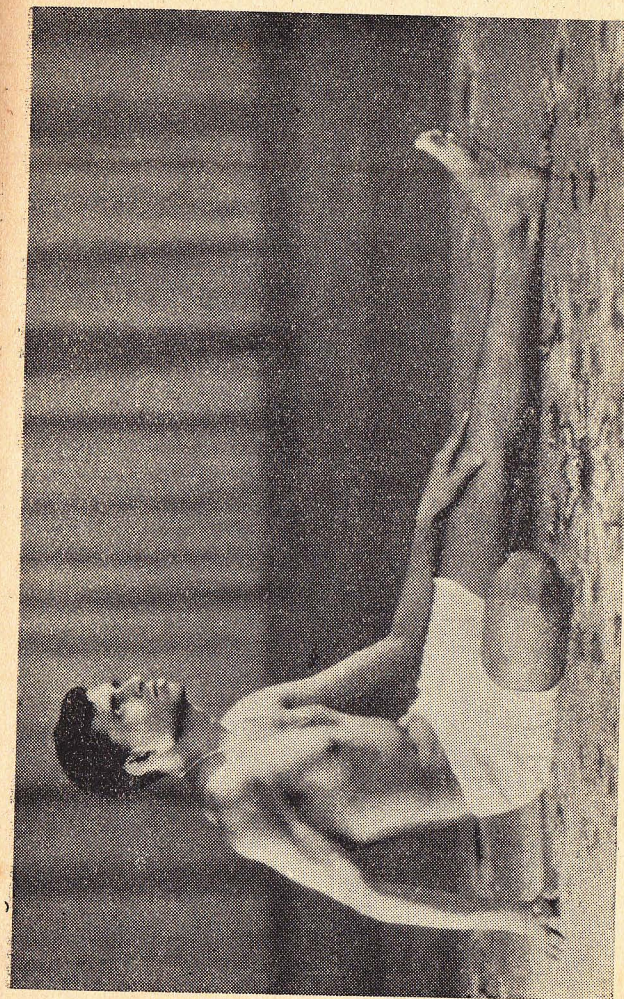
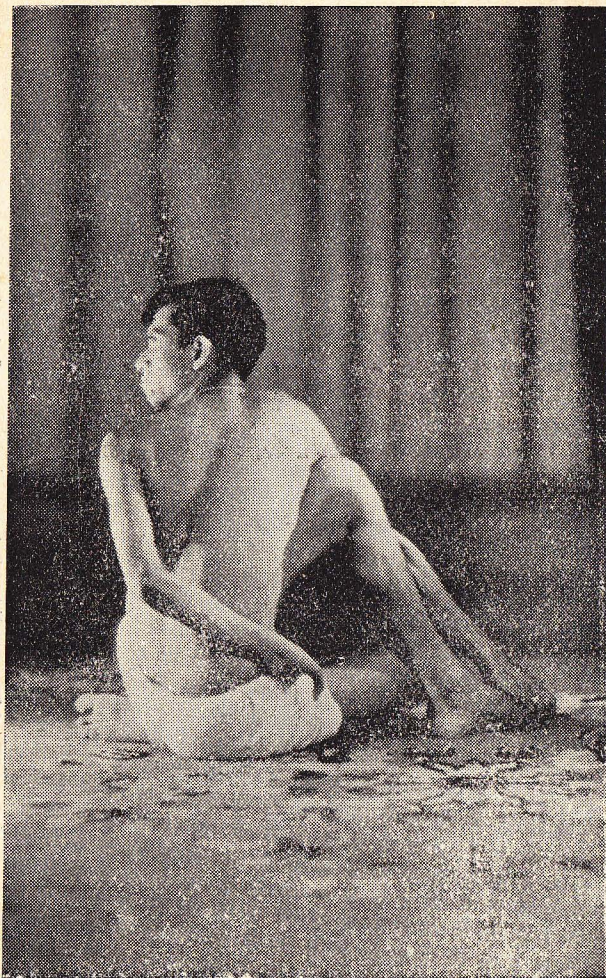


PLATE 19. Ardha-Matsyendrasana, 1st Stage.

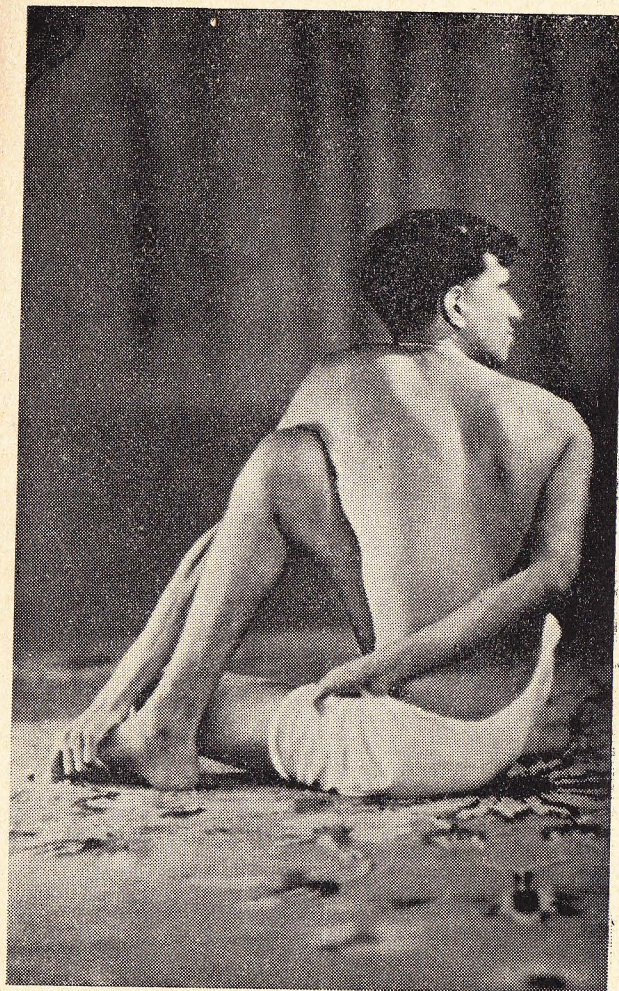




**PLATE 20.**

Ardha-Matsyendra, 2nd Stage.

Left lateral rotation of Vertebral Spine. The asthmatic will hear the wheeze as the air is squeezed out.



**PLATE 21.**

Ardha-Matsyendra, 2nd Stage.

Right lateral rotation of Vertebral Spine. The asthmatic will hear the wheeze as the air is squeezed out.



their maximum limit. Maintain this pose for 5 seconds. Now release and repeat the same process with the opposite legs and arms so as to twist the spine in the opposite direction (Plate 21) and maintain it for another 5 seconds. This forms one round. Do 3 rounds.

**Benefits.**—Lateral rotation of the vertebrae on both sides ensures a rich blood supply to the spinal cord, its spinal nerves and the sympathetic chains. All the organs of the chest and abdomen are massaged. Lumbago and wry neck will become events of the past. All the back muscles are exercised well. Clinically, a tonic influence on the sympathetic is noticeable. \*3 minutes of this asana changes the B.P. from 126-84 to 146-88 mms. Hg.

Time : 2 minutes.

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\* Only typical blood pressure changes in these exercises are given. If an exercise is vigorously done the rise in pressure is greater than when done lightly.

## B.—Relaxation and Sleep.

When the physical exercises including pranayama are over, we must relax our muscles and our mind fully. A suggested method is as follows: lie flat on the bed with the arms by the side. Imagine all the muscles to be relaxed; they must all feel limp. Roll to one side and feel all the muscles relaxed, then roll to the other side and feel again all the muscles relaxed. A little attention at the start to each part of our body may be necessary to ensure relaxation. Finally feel as if you are asleep. In sleep all muscles should be relaxed but it is surprising that in most of us groups of muscles are unrelaxed. If we look at servants, especially rebellious ones, asleep, we often notice them in tension. In sleep also they seem to revolt against orders! This is true of all asthmatics.

Now the mind also must be relaxed. No care or anxiety should have any entrance; instead, joy and blissful ecstasy must fill the mind. There is an acquired variety of asthma that overtakes one in middle life. This is, as a rule, due to unprecedented mental and emotional stress. Therefore relaxation of the mind is of the utmost importance. Those who believe in God are advised to place all their cares and burdens at His feet and invoke His divine grace and blessings. He alone understands our inmost troubles and anxieties and



we testify to the fact that He is ever ready to shower His grace on us.

On the other hand those who are used to taking refuge in the Buddha, the Sangha and the Dhamma should do so with their whole heart. There should be no half way house. Full faith, in whatever one believes, is needed to obtain the fullest relaxation and benefit.

**Sleep** is of the utmost importance to man. Without sleep one cannot live. There is nothing more refreshing than sound sleep, for during sleep we are in complete communion, though unconsciously, with God, according to Yoga. According to Buddhism during sound sleep one unconsciously attains the bliss of Nirvana. The great ones, who consciously can attain to these great spiritual heights, require much less sleep. The Buddha is said to have slept only 3 hours a day. Swamy Sivananda recommends it to normal people. But with the great wear and tear in the physical and mento-emotional planes, that we of the world are heir to, three hours are not at all enough. 'Early to bed and early to rise' is a good maxim. When there is paroxysm at night the deficient sleep must be made good by day. During sleep a spiritual force seems to descend on the prana-maya-kosha, (Chapter X) and this gives a 'charge' to the nerve cells in particular and to all cells in general.

In certain bad cases, for a short time, till our exercises give enough relief, recourse may have to be taken to medicines to stop the

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paroxysm, which prevents sleep. A Franol tablet or two may be taken  $\frac{1}{2}$  an hour before bed time. This tablet contains only  $\frac{3}{20}$  grain of Ephedrine and 2 other auxiliary medicines in very small doses. Therefore it may be safely taken 3 or 4 times a day if necessary. Some prefer the use of an atomiser with a spray of Riddobron. Whiffs of this medicine may be sprayed into the back of the mouth (and the nostrils if necessary) while taking an inspiration. As soon as sufficient relief is given the exercise of Bhastrika and the Author's should be taken before sleeping. Rarely will one be awakened later in the night. Both the medicines and the exercises may have to be repeated in the early hours of the morning, if a paroxysm puts up the patient.

Normally, the devout votaries of all religions pray at bed time and again begin their meditation or prayer early in the morning at any time between 3 and 6 a.m. The asthmatic who gets paroxysm at these hours should infer that it is an indication from God that he or she should meditate or pray at these hours. It is advisable to incorporate in the meditation what is given in Appendix I.

### C.—Some Minor Hints.

It may be asked when these special exercises should be taken. Certainly not during a paroxysm. A doctor's help may be needed for a few days to stop the paroxysm. When one is convalescing one may begin with Ujjayi.



This must be practised regularly till paroxysms can no more invade.

The other exercises should be taken in the order we have given. Bhastrika is the next exercise (*vide* Chapter III). This makes one proof against paroxysm and cough would be greatly controlled. Following this is Kumbhaka or retention of breath and then comes the author's special exercise. The last is Uddiyana. The general exercises given in Chapter VIII are very helpful, especially Sirshasana and Matsyasana in resistant cases.

It must not be supposed that we should at this stage give up pranayama; no, we should continue to take them for the rest of our lives. The more we take them, the more healthy we become. We become real specimens of health. Is this not a goal worthy of achievement?

When one has mastered these exercises, one is advised to practise Bhastrika and the author's exercise first. These may be done on the bed itself. If one has no time these alone are enough. Ujjayi may be done in the car, or train, or in the office chair. Kumbhaka or retention of breath may be done anywhere where no one is at hand to talk or disturb. Uddiyana, Bhastrika and the author's exercise should not be treated lightly. They have to be done in one's room on an empty stomach; so should the general exercises. Commonsense must prevail all through, *e.g.*, wet feet and exposure of the chest to cold draughts should be avoided.

#### D.—Functions of the Nose; Clearance of the Respiratory Passages and their Offshoots; Cure and Prevention of the Common Cold, and Sinus Affections.

The air we breathe in passes through the nose. Its temperature is raised and its humidity increased during the passage. Dust and bacteria are also arrested. With the other functions of the nose, *viz.*, smell and resonance of voice production we are not concerned here.

The mucous membrane of a normal nose secretes about 12-18 ounces of viscid fluid daily. It is supplied by the 7th cranial nerve (Parasympathetic) through the spheno-palatine ganglion. One side of the nose secretes and fills while the other side throws off the secretion. This takes place in cycles of two hours. Bray puts it down as two and a half hours. We found two hours as the average period for Ceylonese and our finding tallies with that of Yoga. This secretion arrests dust particles, bacteria and other organisms. When it is thrown off we pick it up with our 'kerchief in the form of dark scabs or we blow it away with the breath.

The breathing exercises clear up the nasal passages and the rest of the respiratory tract. The current of air, as if it were, washes away all the dust of infection and the matter of inflammation even as a stream of water does to the dirt in a canal and keeps the mucous membrane of the entire respiratory tract in a healthy state. The so-called asthmagenic area in



the nose will become as normal as in a non-asthmatic. The mucous membrane is toned up by the streams of air so well that dust-proteins falling on it cause no more inflammation as in hay-fever. The current of air in Ujjayi and more so in Bhastrika is forcible. This current is further intensified when we block one nostril or the other to suit our requirements during the two exercises. When the two nasal passages are so well cleared up one almost never catches the common cold. It is out of the question; and those who were once victims of hay-fever become normal and healthy. In the early stages of these exercises even if one catches a cold it is never troublesome and it clears up much sooner than before. Of course one must avoid much perspiration as far as possible. If there is a tendency to perspire one does well to work under a ceiling fan. If one is already soaked in perspiration it is definitely harmful to be under a fan. Then the clothes must be changed.

The postero-lateral walls of our throat (*i.e.*, just behind the nose and mouth) is connected by two narrow tubes called the eustachian tubes (auditory tubes) with the two ears. Each tube leads into the middle portion of the corresponding ear, called the tympanum or middle ear. The tympanic membrane or the ear-drum forms the external wall of the tympanum. In health this eustachian tube is patent and the air in the middle ear is in free communication with the atmospheric air. When we

have a 'cold' this tube gets partially blocked and hearing is temporarily impaired. If the infection is other than that of common cold, *e.g.*, influenza, the inflammation of the throat soon spreads to the middle ear causing unbearable pain, fever and pus formation (middle ear suppuration). By simple breathing devices we can ensure the cleanliness of these eustachian tubes. We have to close both nostrils with our fingers and with mouth shut press the air in the throat and mouth into these two tubes. When this is effectively done we feel a bulge in the ear-drums and hear a sound of this bulge; with further experience we can do this quite easily without recourse to closing the nostrils.

With still further practice we can easily send the healthy current of air into the various air cavities or sinuses in the bones of the face. All these air sinuses are continuous with the nose. In the upper maxillary bone, *i.e.*, the part adjoining the nostril there is a cavity called the maxillary antrum or maxillary air sinus. We can blow the air into these cavities and can verify it by placing our fingers over them on the face. Similarly there is a cavity just on the upper border of the eye socket called the frontal air sinus. If we go further behind laterally and upwards from the nostrils we reach the ethmoidal air sinuses. Behind these are the sphenoidal air sinuses. We can with practice clean these also by the respiratory current of air and avoid the chronic suppurations of these sinuses. When suppuration



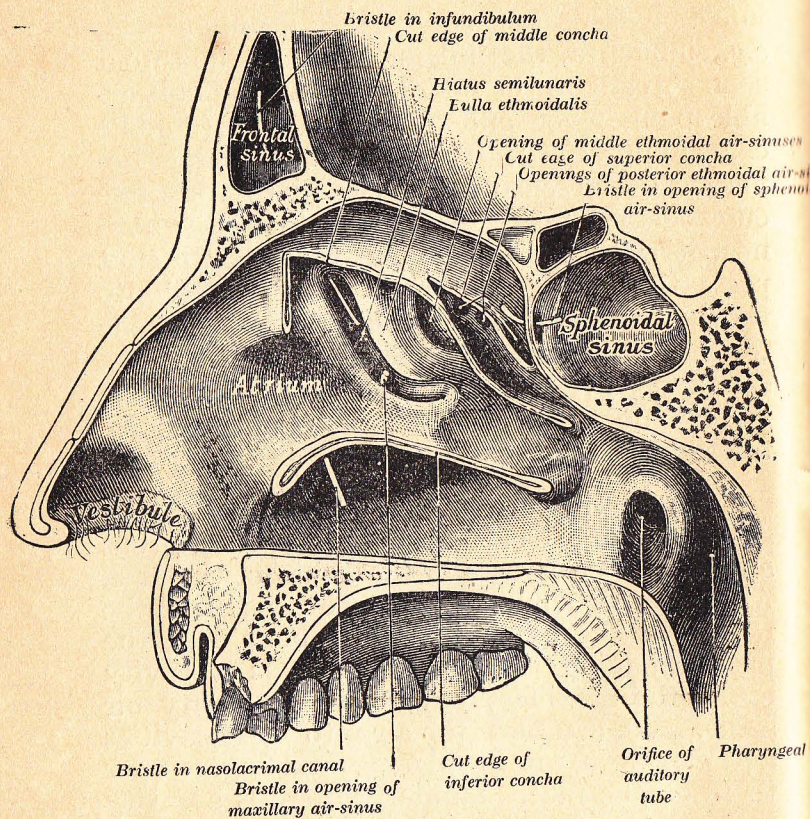


PLATE 22.

Frontal Air-Sinus, Sphenoidal Air-Sinus, Eustachian Tube  
(Auditory Tube) and Nose.

( Gray ).

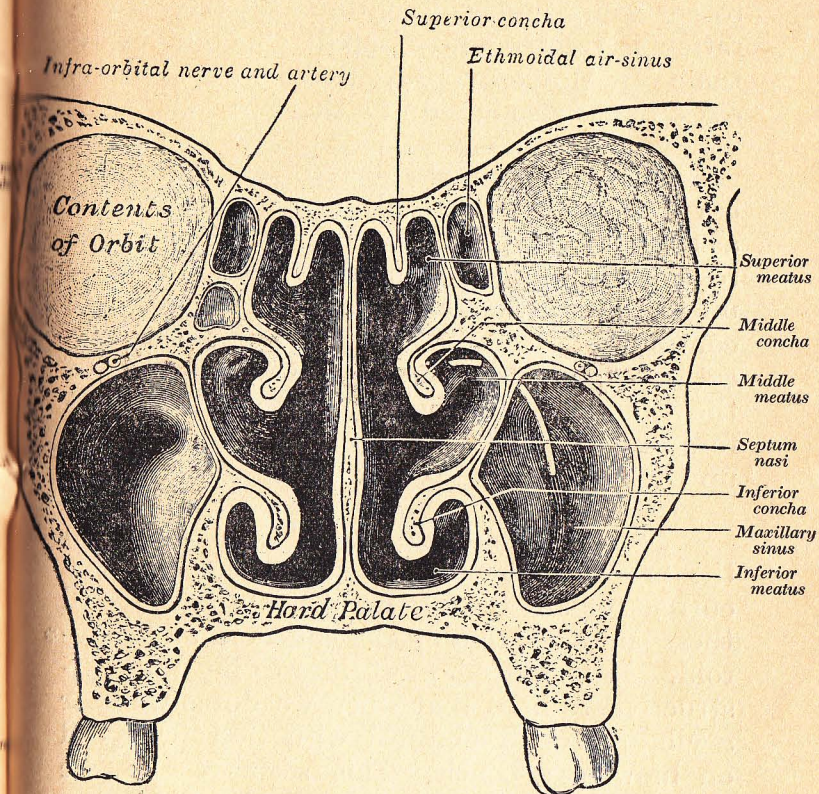


PLATE 23.

Maxillary Sinus, Ethmoidal Sinus and Nasal Cavities.

( Gray ).



of these sinuses is present asthma is known to get worse and will continue till the suppuration is treated and cleared. Such an eventuality is not only prevented by these exercises, but is also cured in a short period.

It must be remembered that these air cavities are so beautifully arranged as to act as resonant chambers to our voice. The entire respiratory mucous membrane from the lungs up to that in the sinuses and the nose is one continuous sheet. There is free communication of the air in these sinuses with that of the atmosphere through the nose. It is therefore obvious that with practice we can clean up these cavities also with gusts of air.

We can chant the word 'Om' and with the 'm' sound vibrating send the expiratory current of air to the middle ear and to all these sinuses including the sphenoid and ethmoid. It is indeed most interesting and instructive to note that when we do so we hear a vibrant sound identical with that produced on blowing a conch. This seems to be the reason why the conch is used on all Hindu ceremonial occasions.

According to the *Siddhars' school of Yoga* which comes down from ancient times, we must initiate inhalation from the naso-pharynx, i.e., from the part just behind the nose, *vide* Plate 17 and not from the outermost part of the nostrils, as we ordinarily are used to. This

ethmoid \*

method of respiration, where the main dynamic inlet and outlet is the naso-pharynx, certainly circulates the air through all the air sinuses and the middle ear. The modern "*Siddha Medicine*" originates from these *Siddhars*. There were 18 well-known Siddhars\* most of whose works in Tamil are available even today.

\* In the book entitled "Bhogar's Seven Thousand (Verses)" the Author describes seeing, on the 13th mountain north of the Himalayas, a Yogi with an elephant's face, who is known as *Ganeshar*. This great figure had lived through the Kreta Yuga (17,28,000 yrs.), Treta Yuga (92,96,000 yrs.), Dwapara Yuga (8,64,000 yrs.) and the past portion of the present Kali Yuga. This is the 5,052nd year of the Kali Yuga, which has a span of 4,32,000 years according to the Hindu Calendar. Bhogar had spent a part of his time in China and he tells us in this book that the Siddhars had written books in many languages. Bhogar refers in this book to his visit to Kailas the holiest place of the Hindus. *Kailas* is on the 21st mountain north of the Himalayas and not on the Himalayas itself, according to him. Milarepa, a great Tibetan Yogi, also testifies to the existence of *Ganeshar*. He also could fly and had been to Kailas.

According to Hindu tradition Bhogar had his samadhi (saintly burial) in Palani, South India, at the very site where the Palani temple, in honour of Subramaniam, a manifestation of God (Shiva), stands. A true Yogi's body is said never to perish nor disintegrate, and according to Siddhars' tradition, the soul of a Yogi appears to his disciples and devotees in the same physical form as before, whenever they pray for his blessings. (c.f. Jesus Christ's manifestations after his burial; Saint Martin de Porres of Lima by his manifestations, before and after his death, confirms Yoga's findings. Faith, according to Yoga, can also procure all the 8 siddhis.

Some believe that God performs His miracles in these temples through the medium of such Yogis, since the latter's only wish and work after their samadhi, is to do good to humanity by miracles. Be what it may, the present author personally witnessed the following miracle in the house of an ordinary semi-literate, but saintly Tamil woman in a tiny hamlet called Maruthur, situated near Villipuram Railway Junction in South India. He (the author) offered flowers and fruits to the God of Palani through this devout woman. She kept them in a metallic tray and, raising it above and in front of her, asked God (of Palani) to accept the offering. Lo and behold!



**E.—Dress.**

One word about dress is necessary. There should be nothing tight round the neck, chest or abdomen. All forms of dressing that make for perspiration should be avoided. The clothing, in general, should be as light as is compatible with the climate.

Saleeby points out that black materials absorb sunlight and prevent the ultra-violet rays from penetrating through into the body.

Sandals or shoes should always be worn to suit the climatic conditions since bare feet, impinging on a cold cement floor or a wet ground, provoke a paroxysm.

**F.—Singing.**

Singing is indeed a fine exercise to get rid of asthma. As we sing we are exhaling through a glottis that is being modified all the time to

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the flowers and fruits just vanished, leaving the empty tray in her hands!! After witnessing a series of such miracles for two hours the author asked her to get back the garland only, as prasadam. She raised her empty hands in supplication and called for the garland. With a thud the garland fell into her palms. It is interesting to note that the flowers, bought by the author at about 8 a.m. near Trichinopoly, were quite parched and dry at the time of offering (1 p.m.) but at 3 p.m. when it was received as prasadam it was soaked with theertham (holy water). Palani is situated well over 100 miles from the Maruthur railway station.

Thirumoolar refers to Bhogar's Guru as the Head of one of the seven *Madams* that were established by the disciples of Nandi; but the language of "Bhogar's Seven Thousand" is relatively modern and therefore the contents of the book have to be accepted with great reservation and on the merits of the statements made.

suit the varying pitch of the song. The longer the note the better it is. In a more pleasant way it resembles exhalation in Ujjayi. Therefore it should be encouraged, especially devotional singing, because the peace and bliss of the devotion are also valuable to soothe the sudden eruptive discharges of nervous energy from the vagus motor nuclei.

Less effective but another useful exercise is speaking oratorically in private. The same principle underlies this exercise as singing.



## CHAPTER IX.

### BATHS.

#### VENTILATION.

Baths are a necessity for a clean and healthy life. In the Tropics at least one a day is needed. Not a few like to take a wash at least, if not a bath, after the day's work also. Those who do field work, *e.g.*, engineers, civil, electrical, motor, etc. or masons, labourers, etc. must of necessity take a bath in the evening.

The question arises as to the temperature of the bath. During the six to twelve months after the last paroxysm we advise tepid baths. Our body temperature is  $98.4^{\circ}\text{F}$ . The bath may be about  $99^{\circ}\text{F}$ . In temperate climates the baths are always hot and there is no need to change them. The only care one should take after a hot bath (*i.e.*, over  $100^{\circ}\text{F}$ .) is that for two hours at least one should be indoors. After a tepid bath one has to be indoors only for about half an hour. Some authorities advise their patients to finish a hot-water bath with a cold one. Gandhi favoured it. It is valuable if one has to get out of one's rooms immediately after the bath. It may be done with caution, especially so in temperate climates.



Incidentally one must remember the purpose of baths. Obviously one purpose is to clean all the pores of the skin, wash away all perspiration and dirt. Another is to cool the body in the tropical climate and to heat the body in the temperate one.

In the Tropics also we have the hills, where the bath is desired to warm us. The third purpose is to stimulate our entire body. It tones up the nervous system and skin particularly; through the nerves all the organs are toned up. For this third purpose a short quick bath, *e.g.*, shower bath is all that is required, but for the first two purposes a long bath is needed, *e.g.*, English bath.

In hospitals baths at a constant temperature, with automatic adjustable electrical arrangement, are available, and it had been found that prolonged hot water baths with the whole body up to the neck immersed in water, not only cleanses the entire skin very well, but also soothes the nerves. This is a routine treatment given to selected mental cases in all modern hospitals. Asthmatics are very nervous. Some have complained that even during sleep their hands are clenched! To such patients during their healthy periods long hot water baths are recommended. Maniacs remain in the baths for hours on end and they feel so well that they sing in joy!

During the asthmatic state, *i.e.*, during the period when one gets paroxysms, presence of sweat on the chest for a long time does much

harm. Sweating must be prevented and a change of clothes is indicated when there has been much sweating. After profuse sweating a hot bath in the Tropics produces much perspiration and therefore should be avoided; a tepid bath serves the purpose well. It is free from the after effects of perspiration.

In the Tropics there must be free and ample ventilation in the room. But in seasons when the atmosphere is charged with dust proteins, *e.g.*, pollen, only one window should be open. Fans are suggested to prevent perspiration. One may use revolving table fans or ceiling fans. They must have regulators, otherwise when one is fast asleep one may catch a chill. On warm non-dewy nights one may sleep in the verandah or open terrace. Moist atmospheres must be avoided as far as possible at the start, *e.g.*, houses near rivers, canals or ocean.

As freedom from paroxysms increases in duration one must have as his goal "hardening of oneself," *e.g.*, cold baths on chilly days, or getting wet in the rain or working with clothes soaked in perspiration. In other words one should become quite a normal person fit to stand all onslaughts of nature. Sunlight is a great factor in this process.

We must make it a point to increase the duration of sunbaths and their frequency. When we think of our farmers who plod all



day in their rice-fields and vegetable gardens, and our coolies who work all day in the hot sun on the roads or on the estates, need we entertain any fear of possible harmful effects of too much ultra-violet rays? Such fears are groundless, provided we do our sunbaths in the graded system recommended earlier. It is indeed difficult to find an asthmatic patient amongst these farmers. All-day picnics are pleasant methods of attaining this end. Long country walks may be organised. A sunbath is followed by a hot bath and never by a cold one.

We know of an English Director of Education, who was a consumptive at one stage. He used to go on his rounds of inspection of schools from the North to the South of Ceylon on his push bicycle, and finally got over his infection. In the same way asthmatics should devise ways of leading an open air life for certain periods during their healthy intervals. On the whole, during seasons, when the air is saturated with pollen dust, open air life is not recommended.

The inhalation of fresh oxygen, from oxygen cylinders, cuts short a paroxysm. If one has to share a room with others there must be a minimum of 1,000 cubic feet of space for each person.

## CHAPTER X.

### DIET, ACCORDING TO AYURVEDA AND ALLOPATHY.

Diet finds an important place in our lives. It assumes special importance in asthmatics since there is an inborn error of metabolism and a special reaction by them to certain types of protein.

To begin with, we recommend the diet which one is already used to. Those who are used to vegetarian diet are advised to stick to it and those used to a mixed diet are also advised to stick to it. Any major change during an illness is not desirable. It must however be noted that certain proteins definitely increase the illness, but the nature of the protein varies with the individual.

First we shall discuss the frequency of the meals. During the asthmatic state, *i.e.*, when paroxysms have not yet left, diet should be well selected. Solids are allowed only by day and only between paroxysms. Sometimes a paroxysm lasts for hours. During such times one may take only liquids every two hours. If a cup is too much half a cup may be taken every hour. Concentrated liquid diet should be given at such times, *e.g.*, malted milk or any milk food to which one is used ; the following



should be tried with caution; essence of chicken, panopeptone, partly digested food, *e.g.*, peptolac, proteolysed liver extracts; glucose may with advantage be added to sweeten according to taste. Glucose is nothing but digested sugar. In our small intestine practically all the carbohydrates are finally converted into glucose and it is in this form that carbohydrates are absorbed by the blood into the system.

Fruit juices especially orange and papaw flavoured with glucose are also recommended. Fruits are rich in glucose and fructose and both these constituents are absorbed by the blood straightaway. Ayurvedic medicine states that fruits are cooling and therefore should be avoided in asthma. Allopathic or Western medicine does not agree with this. The blood sugar is decreased in asthma. Therefore glucose in particular and carbohydrates in general are recommended. Therefore soups made out of carbohydrates like potatoes, carrots, beetroot, tomatoes or rice canjee are good.

**Ayurvedic View.**—According to Ayurveda, there are 5 features in any article of diet *viz.*, (1) *Rasa* or taste, (2) *Guna* or quality, (3) *Virya*, *i.e.*, cooling or heaty, (4) *Vipaka*, *i.e.*, change which it undergoes inside the body, (5) *Prabhava* or its special nature. Of these five, '*Virya*' is an enigma to allopathic doctors. Careful clinical observation shows that some articles of food, *e.g.*, grapes, bananas, young coconut milk, curds, jak fruit, and pomegranates are stimulants to the parasympathetic and definitely increase the asthma. Within

30 minutes of ingestion of these articles of diet there is, in an asthmatic subject, an increased secretion in the nose and consequent difficulty in breathing; cough also rears its head; other articles of food, *e.g.*, goat's milk, honey, chilli and ginger are stimulants to the sympathetic, and these do good to the asthmatic.

The following table gives a comparison of these two kinds of food.

**Foods with  
'Shita Virya'**

( Cooling Foods )

*Para-sympathetic  
stimulants.*

Grapes, bananas, young coconut milk, curds, home-made butter, jak fruit, pomegranates, pineapple, figs, woodapple, coconut, sweet almonds.

Cow's milk, oranges, prunes, lime fruit, dates, jak fruits.

( Apples take an intermediate place ).

Ulunthu (Tamil) or black gram, grams, sugar-cane, sago, tomatoes.

Dhal, nelli (Tamil) or Indian gooseberry, ladies' fingers, watermelon, eluppai (Tamil) or Mahwah oil.

**Foods with  
'Ushna Virya'**

( Heaty Foods )

*Sympathetic Stimulants.*

Papaw, goat's milk, ghee, arecanut, coffee.

Brinjal, drumstick, cashew, avarai (Tamil) or dolichos lablab, betel, bitter almonds, mullangi (Tamil) or rabo (Sinhalese) or garden radish, margosa oil, gingelly oil.

Thoothuvalai (Tamil) or tibbattu (Sinhalese) or Solanum trilobatum, arunelly (Tamil) or country gooseberry, saffron.

Perumjeerakam (Tamil) or maduru (Sinhalese) or anise seeds, nutmeg, cardamom, garlic, ginger, onion,



Payathangai (Tamil) or dolichos tranquebaricus or makaral (Sinhalese), green gram, peas, cape gooseberry, bo-tree, banyan tree.

Motchai (Tamil) or dolichos-tetra-spernus.

Potatoes, sweet potatoes, siruvalli (Tamil) or sweet yams.

Jeerakam (Tamil) or cumin seeds or suduru (Sinhalese), dried long pepper.

Indian sarsaparilla, pon-nankani (Tamil) or muku-nuvena (Sinhalese) or alteranthera sessiles, rice, wheat, barley, agathi (Tamil) or kathuru murunga (Sinhalese) or agati grand-flora, lotus, vallarai (Tamil) or gotukola (Sinhalese) or Indian pennywort.

Koddikilangu (Tamil) or aponogeton mono-stachyon.

Pasalaik-kirai (Tamil) or nivithi (Sinhalese) or Indian spinach.

Neermulli (Tamil) or Hygrophila Spinosa.

chilli, karunjeerakam (Tamil) or black cumin seeds or kaluduru (Sinhalese), pepper, long pepper (green), opium, ganja.

Thinai (Tamil) or Italian millet.

Seendil (Tamil) or tinospora cordifolia.

Sivadai (Tamil) or turpeth root.

Kungiliam (Tamil) or saul tree resin, kungku-mapoo (Tamil) or crocus.

Arukirai (Tamil) or amarantus tristis.

In continuation of this table a few words of explanation are necessary. Dates possess 'ushna virya' to a slight extent, but on account of the changes it undergoes in the body (vipaka) it acts as a refrigerant, *i.e.*, like one with 'shita virya.' The following flesh foods produce in a similar way their respective effects.

*Mutton, beef and fish* increase mucus secretion, but decrease vayu. In uncomplicated asthma, which is essentially a vayu irritation, where there is no phlegm formation, they do good; but when much mucus is present they are bad. This seems to be the reason why at certain times they agree and at other times they disagree with the patient. The meats of porcupine, lacerta iguana or oodumbu (Tamil), *hare, rabbit* are recommended for asthma. The same with *venison*. The meat of *pigeon* worsens pure asthma, but it decreases the phlegm, when the latter is troublesome. *Pork* is said to decrease vayu irritation though that of the *wild pig* increases mucus secretion and cough. The meat of *shark* is good for asthma; it decreases both the mucus and the vayu irritation. *Fowl* curry is said to be heaty and therefore good for asthma; the meats of *prawn, tortoise, duck, stork, swan and turkey* are said to be bad.

Of course, when solids are not indicated, during the asthmatic state only soups, made out of them, may be tried.

1. The above are culled from Murugesu Mudaliyar's 'Materia Medica.'

2. Protein-rich foods are para-sympathetic stimulants and are not, as a rule, good for asthma.

\* The actions of flesh foods are taken from Kannusamy Pillai's 'Materia Medica.' It is popularly held among Ayurvedic Practitioners that mutton and pork are 'cooling' while beef and fowl are 'heaty.'



The asthmatic will do well to select the foods which are 'sympathetic stimulants,' especially during periods when an oncoming attack is feared and of course during the attacks. The earlier remark that during the illness one must be *cautious of protein diet* applies to all these animal foods also.

It is accepted that the para-sympathetic is anabolic in nature (*i.e.*, cooling), while the sympathetic is katabolic (*i.e.*, heaty). In asthma there is vagotonia. Among fruits, oranges are not so cooling as grapes and are therefore better tolerated.

According to Ayurveda there is a variety of asthma in which *Pitta* is upset, *viz.*, *Vayu-pitta Swasa*. In such cases cooling food, *e.g.*, grapes, being antagonistic to pitta, do much good and form a favourite class of food. We know of a few asthmatics who would willingly pay any price for grapes when they are not in season.

To Allopathic doctors a few words of elucidation are needed. \*Asthma, according to Ayurveda, is essentially a *Vayu-irritation*, corresponding to the purely nervous bronchial asthma. Vayu is the primordial force that works through the central nervous system. There are 5 varieties. In asthma we are concerned with Prana-vayu. There is another form of asthma where the kapha is also disordered, known as *Vayu-kapha Swasa*. It is

\*According to *Siddha Medicine* asthma is essentially a 'Kapha dosha'. This is in agreement with the author's views.

in this variety that bronchitis complicate asthma. Here Vagotonia is present markedly and cooling food is contra-indicated. The third variety is the *Vayu-pitta Swasa* mentioned above.

To tally with our theory of asthma we offer the following modification of the classical Ayurvedic theory. Humanity is divisible into 3 categories, *viz.*, (1) Phlegmatic or tamasic type where Kapha predominates, (2) Rajasic or active type where Pitta predominates and (3) Satvic or ideal type where Vayu predominates. According to our research Vayu is related to the central nervous system, Pitta to the sympathetic nervous system and Kapha to the para-sympathetic. We hold the view (*vide* Chapter XI) that asthma is caused principally by the abnormal irritability and activity of the broncho-motor portion of the vagus nucleus. This abnormality is found in all the 3 categories of people. In the first type of people, where the para-sympathetic predominates fruits (cooling foods) are bad. In the second type, where the sympathetic predominates, fruits are very welcome and do much good. In the third type, where the central nervous system predominates, fruits do good because of their mono-saccharide contents (glucose and fructose) irrespective of their 'virya.' In those cases where the asthma is possibly caused by a lowering of the tone of the sympathetic, fruits are bad. Most asthmatics know by experience whether fruits agree with them, and if so which ones agree well.



The allergens of modern medicine, according to Ayurveda, seem to possess 'shita virya' or cooling quality and therefore bad. It is well known that allergens vary in their effects on individuals. Again, the same individual reacts differently to the same allergen at different times (*vide* Chapter XI). These are explained by Ayurveda as follows: Since allergens stimulate the para-sympathetic their effects obviously differ on the 3 categories of people. In Chapters VIII and XII we have shown that at certain times of the day the breath flows more freely through the right nostril than through the left. According to Yoga this is known as the Surya (Sun) Kalai, *i.e.*, heaty; here the sympathetic predominates. At other times the breath flows more freely through the left. This is known as the Chandra (Moon) Kalai, *i.e.*, cooling; here the para-sympathetic predominates. Therefore it is clear why an allergen works on the same individual in one way during Suryakalai and in another way during Chandrakalai. Allopathy cannot account for this.

In between the paroxysms solids should be taken. Here we should concentrate on the quality and not the quantity. Indigestible articles like cakes, food fried in oil, fibrous foods like mature ladies' fingers and fibrous meat should be strictly avoided. Only boiled foodstuffs should be on the table. Rice and curry or bread with a Western menu may be selected according to taste. On the whole

meat is best avoided. Liver and meat specifically increase the disease in most asthmatics. Eggs agree with some. The same with coffee and tea. The individual concerned should observe the effect of these foodstuffs on himself and select accordingly.

The last solid meal should be taken before dusk; otherwise asthma will be definitely worse. After dark only liquids are allowed and that also before 10 p.m. It is best not to load the stomach with anything after that. Plain water or water with glucose may be given for thirst.

It must be remembered that all the respiratory muscles are working incessantly during a paroxysm, and if the latter runs on for hours the heart is tired visibly. Necessarily the circulation is impeded. If the blood supply to the stomach, small intestines and the digestive glands is impeded, as is the case here, the digestion is also impaired. So is absorption. Therefore the intake of food has to be small; we have for this reason advocated the use of predigested foods like peptolac, panopeptone, proteolysed liver extracts, fruit juices, etc.

Normally during digestion gas is formed; most of it is absorbed by the blood and sent out through the lungs. A part goes out as flatus chiefly during defaecation. In asthma digestion is poor and production of gas is increased and since circulation is poor the absorption of gas by the blood is also less. Therefore gas accumulates in the stomach and intestines



and press on the heart and lungs. This increases the distress of the patient. If too much food is taken fermentation and putrefaction set in and foul-smelling gases are evolved in big volumes.

Food is divided into carbohydrates, proteins and fats. Examples of foodstuffs rich in carbohydrates are potatoes, yams, starch, sago, fruits and rice. Those rich in proteins are cheese, meat, fish, beans, pulses. Those rich in fats are oils, butter, fat in meat, yellow part of egg. These foodstuffs, *viz.*, carbohydrates, proteins and fats are needed roughly in the proportion of 8 : 1 : 1. When there is muscular work, *e.g.*, in muscular exercise or in an asthmatic paroxysm more carbohydrates are needed than otherwise. Therefore soon after a paroxysm carbohydrates are indicated, specially digested carbohydrates, *e.g.*, glucose, fruit juices.

Milk contains all the 3 foodstuffs, but in small proportion. Proteins are needed to build up the tissues; goat's milk\* contains twice as much protein as cow's milk; therefore milk-foods are indicated during convalescence. Fats on the whole are heavy and should not be given during the asthmatic state. During convalescence fat, especially ghee, should be taken in

\* Goat's milk, if available, is to be preferred to cow's milk. Those who are averse to taking cow's milk on the ground that it is a 'cooling' food are advised to put into the boiling milk a piece of dried ginger. This removes the shita-virya. In the case, however, of the rajasic type, where Pitta predominates, cow milk may be taken without any ginger. This is known by experience, without any reference to a medical man, by the patient.

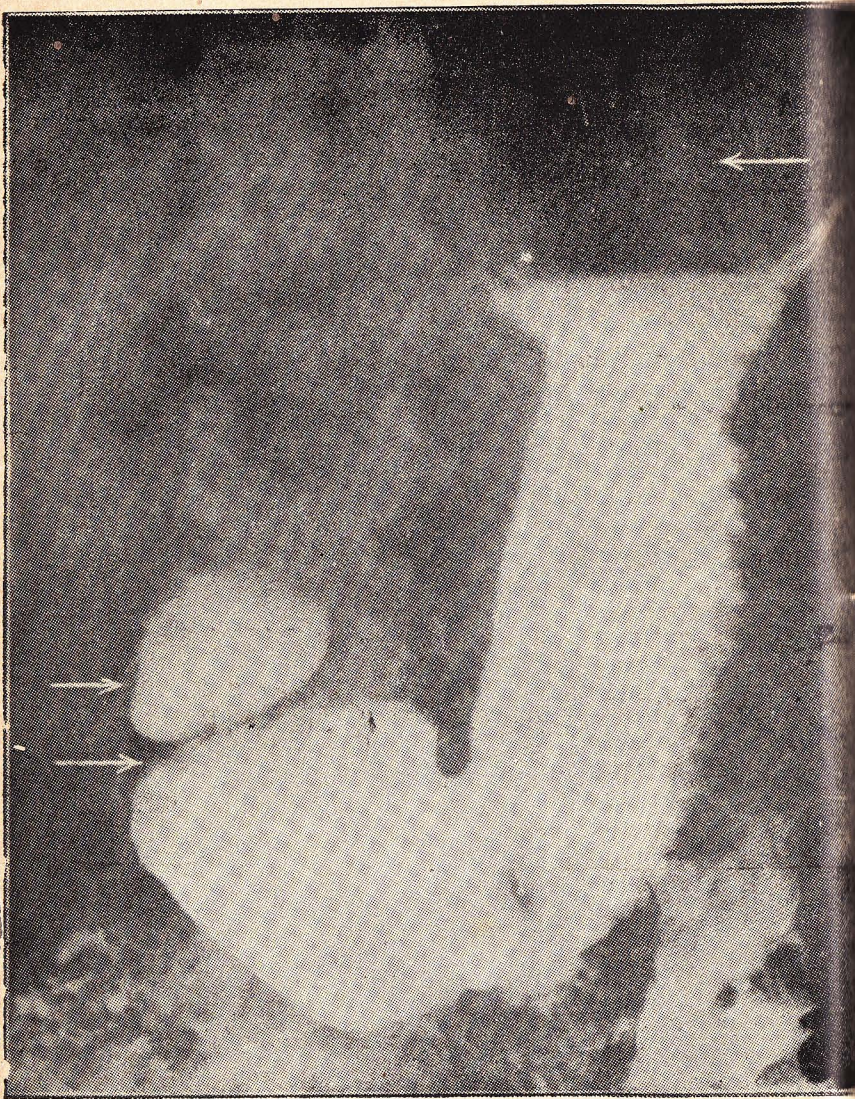


PLATE 24.

Radiogram of stomach; at the top arrow is the air-space



gradually increasing quantities, only a little being allowed at the start. Vitamins are vital accessory food factors. Fruits and vegetables are rich in them. At present there are easily available capsules or tablets, *e.g.*, vigran capsules or multivite tablets which contain all the necessary vitamins. They must with advantage be taken, say, 3 tablets or 3 capsules for a day and should go with the food.

During days, when there are paroxysms, one must be wary of protein ingestion. Certain proteins definitely induce paroxysm in certain patients, just as quinine produces a rash in certain individuals. Therefore one must watch the effect of each protein food taken during that period.

We know of at least one very healthy young adult who invariably gets a profuse urticarial rash all over her body on the ingestion of an egg. In the same way an egg may produce a paroxysm in a certain individual; but at another time the egg may not cause it in the same individual. This is true of asthma but not of the urticaria.

During the illness nothing iced should be allowed, not even iced drinks. After one is completely free from paroxysms cooled foods may be sparingly tried. They increase the cough. On the whole it may be said that the less an asthmatic takes of cooled foodstuffs, the more comfortable would he be; but of course when he has completely got over the

paroxysms and cough, and attained the necessary hardiness he may take with impunity anything iced.

Lastly, it must be remembered that food takes on an average  $4\frac{1}{2}$  hours to reach the caecum. That is, the entire food is for all practical purposes fully digested and all that could be absorbed taken away from the small intestine by the blood and lymphatic vessels when it reaches the caecum. This is why we insist that at least  $4\frac{1}{2}$  hours should elapse after a solid meal before one takes the strenuous exercises.

From the annexed Table, showing our daily requirements, the amount of each variety of food, *viz.*, proteins, carbohydrates and fats is known. From the other tables in Appendix III, Pages 239-245 selection of these foods can be made to suit the taste and variety needed; the quantities wanted are easily calculated from their respective calorific equivalents. Plenty of fruits and vegetables should be taken since they contain valuable minerals and vitamins. These are needed for growth, replacement of wear and tear, increase of bodily resistance to infections and prevention of deficiency diseases. The mineral salts are *electrolytes*; that is, when dissolved in water they yield electrically charged particles called ions. These, as if it were, put life into the protein molecules.

The annexed Table is a specimen of a balanced diet. It gives the daily requirements for an adult, who leads an ordinary average



# DAILY DIET FOR ADULTS

FOOD	Quantity	Protein in Grammes	Fat in Grammes	Carbohydrates in Grammes	Calories	Calcium in Grammes	Phosphorus in Grammes	Iron in Milligrams	Vitamin A	Vitamin B <sub>1</sub>	Vitamin B <sub>2</sub>	Vitamin C	Vitamin D
Hoppers, 2	3 ozs.	6.9	—	49.5	198	—	0.06	0.86	—	+	+	—	—
Rice (Polished) ...	10 ozs. (or 1 measure)	20.0	—	220.0	970	—	0.30	6.00	—	—	—	—	—
Potatoes ...	2 ozs.	1.2	—	9.4	42	0.01	0.04	0.4	+	+	+	+	—
*Dhal (Yellow) ...	1 oz.	6.2	1.2	16.0	97	0.04	0.07	2.6	+	+	+	—	—
Vegetable Fruits (Ladies Fingers Bandakka or Vendikkai)	2 ozs.	—	—	4.0	20	0.06	0.04	1.2	+	+	+	+	—
Green Leafy Vegetables: Goutko (a (Simalase) Vallar (Tamil)	3 ozs.	—	—	6.0	27	0.33	0.06	3.3	+	+	+	+	—
Fruits (Orange med. sized)	4 ozs.	—	—	12.0	48	—	—	—	+	+	+	+	—
Cow's Milk	8 ozs.	7.2	8.8	11.2	152	0.24	0.16	—	+	+	+	—	+
†Coconut ...	2 ozs.	2.0	16.6	4.5	176	—	—	—	—	—	—	—	—
Butter ...	3 oz.	—	18.0	—	162	—	—	—	+	+	—	—	+
Sugar ...	1 oz.	—	—	28.0	112	—	—	—	—	—	—	—	—
TOTAL		43.5	44.6	360.6	2,004	0.68	0.73	14.1					
The Dhal may be replaced by :													
Fresh Lean Fish ...	3 ozs.	16.5	0.9	—	69	0.18	0.12	—	—	+	—	—	—
or Lean Beef ...	2 ozs.	12.4	3.4	—	80	—	0.10	1.2	—	+	+	—	—

\*Half of the dhal may be replaced by blackgram (ulunthu) for Dosai, Idadly or Vadai during health; but during periods of asthma the dhal is best replaced by another 5 ozs. of milk and among vegetables preference is given to brinjal, drumsticks, rabo, thoothuvai.

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life. The energy requirements (2,000 calories) the mineral (calcium, iron, etc.) and the vitamin needs are all satisfied by this diet. Those who do manual work require more. Bricklayers may need double this and more. Adolescents (between 13 and 18 years) require as much as adults. Children between 8 and 12 require about  $\frac{3}{4}$  of the adult diet, and those between 4 and 7 require about  $\frac{1}{2}$  of the adult diet and those between 2 and 3 require about  $\frac{1}{3}$  of the adult diet. Children grow and therefore require more protein and calcium than adults. This is fully supplied by increasing the milk. Expectant mothers require more food since they have to supply nutrition to the growing foetus. During the nursing period they require still more.

The low bill of fare is more suitable for asthmatics than the high one, advocated by the average physiologist, especially in the matter of protein. In any case the most accurate arbiter is hunger. Its appeasement gives the signal to stop a meal.

But intelligent people must make better use of the modern physiological advances. If we over-eat we defeat the very purpose of food. For example, if we take 500 calories of food a day more than our requirements we put on roughly one pound weight a week. It is obvious that the body's weight can increase up to a certain point only; beyond that the excess is sent out as glucose in urine (glycosuria) or as albumen in urine (albuminuria). What cannot be absorbed by the intestine undergoes



fermentation in the case of carbohydrates and putrefaction in the case of proteins. A certain part is also excreted through the skin causing irritation (dermatitis). When an excess of proteins is ingested more nitrogenous substances circulate in the blood than normally and these also probably take part in increasing the irritability of the vagus nuclei. Unfortunately this state of affairs is much too common !

\*Nicholls, as Head of the Ceylon Nutrition Department, advocated 3,000 calories of diet for an average man. His successor Nimala-suriya was wiser and brought down the figure to 2,600 calories. Chittenden and quite a few others recommend only 2,000 calories. We suggest that for tropical countries like Ceylon or India this is more than enough and therefore make an earnest appeal to our readers to try this lowest bill of fare. They would soon find an influx of energy in their system and this energy is of great value in the eradication of asthma. This subject of energy is discussed more fully in a later section of this chapter, Pages 167-191.

**The Role of Fat.**—The excess of food that we eat is stored partly as fat. This is deposited in the subcutaneous tissues notably in the breasts, buttocks, thighs and abdomen. It is also found in most organs and as padding to these organs. An important function of it

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\*Nicholls, since retirement, in his recent popular book "Eat and be Healthy" (1947), recommends 2,500 calories of food for all above 14.

is to supply energy to the body when it is required, *e.g.*, in starvation ; besides this function as a valuable reserve store of energy it also takes part in the prevention of the loss of heat. In cold climates, *e.g.*, temperate zones, it is invaluable for this purpose. In the Tropics especially during summer if there is too thick a layer of fat, the heat loss is decreased and therefore the fatty subject, being unable to cope with the heat produced in the body, is quite uncomfortable and ill. The sweating mechanism therefore has to overwork in order to increase the loss of heat ; and too much of sweat increases asthma. Therefore it is advisable for very fat people to fast ; another easy method is to bring down the weight by one pound a week. This is done by taking 500 calories of food less than his usual intake per day. When he has reached his optimum weight he should stop this low ration and adjust his diet according to our advice. In Appendix III tables of normal weights for boys and men are given. Ten per cent. above or below the standard weight is allowed as normal. In certain families, however, there is an increase or decrease in weight beyond the ten per cent., as a family trait.

We know of a medical man, trained in a celebrated British University, developing Diabetes (glycosuria at 4 per cent.) at 35 ! The blind acceptance of his Physiology Professor's teaching, as suitable for the Tropics, was certainly a responsible factor for this calamity.



He opened his eyes only when we discussed it with him. There are quite many such cases among medical men. 2,000 calories of diet, built up according to our table, serve all energy and material requirements. There is enough in this diet for the building up of normal healthy cells, with hundred per cent. capacity for resistance to diseases; at the same time no energy is needed to combat diseases caused by faulty nutrition. Through such healthy cells *pranic* energy flows easily and fully and it is utilised to combat functional diseases like asthma. This is further treated in the next 2 sections of this Chapter.

## FASTING.

### The Removal of the "Inborn Error of Metabolism."

The first error in feeding is made when the newly born baby is fed soon after its birth. No baby should be suckled earlier than six hours after delivery. The best time to suckle is when the baby cries at any time between the 6th and 12th hour of birth.

The foolish nurse and the fond mother are not aware that the baby which was for ten lunar months in a warm fluid inside the mother's womb has to get used to an atmosphere of a lower temperature, that it has to get used to breathing through the lungs, and furthermore that quite a few organic changes in its body take place, *e.g.*, the opening in the interauricular septum has to close, the ductus arteriosus has to lose its lumen, the umbilical artery has to suffer the same fate, etc. When all these changes are actively going on in the baby's body, it is indeed silly to load its stomach; it is as bad as loading one's stomach before a mile run. The same fond mother suckles it even at the dead of night whenever it cries. A bad stomach is the first legacy to the innocent babe. This wrong feeding is continued right throughout childhood by the mother and later the young boy or girl continues the faulty methods of nutrition. Neces-



sarily the metabolism must get deranged. The cells of the body function abnormally and hence the so-called inborn error of metabolism that is found in asthmatics also. How this metabolism is changed is discussed later.

Now, what can be done at this late stage to remove this error of metabolism? Fasting is certainly a cure, either partial fasting or complete fasting. It works even better if coupled with the Yogic exercises depicted in Chapter VIII.

In a *partial fast*, a meal or two are skipped off daily. In other words the organs of digestion are given rest for a longer time than otherwise; more rest is given to all the cells of the body also. This kind of fasting may be done for a short period or more according to the need. The educated may take full advantage of modern physiological food values (*vide* Appendix III) and eat 500 calories of food less than their usual daily intake. They will lose thereby 1 pound body weight every week. This may be continued till they reach their optimum weight (*vide* Appendix III).

In a *complete fast*, no food of any kind is allowed. It may last a few days or as long a period as 50 days or more. Only water is allowed and that should be taken in abundance. If one decides on a long complete fast one must be under medical supervision, otherwise bad mistakes may be made by omission; *e.g.*, acidosis is liable to occur and to remove it plenty of water should be taken. Plain soda

(as aerated water) may be allowed. On the whole it is advisable to go slow. The body will do well to get used to partial fasts before a complete fast is undertaken; and again a short complete fast at the start is preferable to a sudden long fast. However, one who has studied and understood this chapter can undertake a long complete fast with impunity.

*How should a complete fast be undertaken?*

The first requisite is that the faster should be *happy* that he is fasting; he should have no fears whatever regarding the successful outcome of the fast. Mere giving up of meals is only *starvation*. He should study this chapter carefully. He should read ennobling literature and live in the open as far as possible. A certain amount of physical exercise, preferably in the open, regular baths, thought-elevating mental exercises like prayer or meditation should form the routine of the day. Whenever he is in doubt regarding his health, he should consult his doctor. Headache is a sign of acidosis. He should then increase the volume of water drunk. Good healthy company is also valuable. Hunger is caused in a person by extremely strong (almost tetanic) contractions of the stomach. At meal-times the stomach automatically undergoes these contractions. In two to three days of the fast these hunger contractions stop and hunger is no more felt till very much later when the normal healthy hunger returns.



*True hunger* is not always experienced by the average man. As already stated the mistake in feeding is made from birth. As an adult he takes his meals at the so-called meal-hours, whether he is hungry or not. In other words he stuffs his stomach with food, even at times when the body does not require it. If he does not feel hungry he creates an appetite by taking whisky or medicines! So the poor stomach, in its extreme sense of loyalty to its master, undergoes these strong contractions to bring to his notice that the time for the stuffing has struck. In this false hunger there is an "all-gone" feeling in the pit of the stomach, "something empty" there. This hunger will not wait for a meal, it wants it immediately; otherwise fainting or inability to do any work is experienced. In true natural hunger there is never a "faint-feeling"; it can wait for its meal. It is felt more in the mouth and throat than in the stomach; the contractions of the stomach are not so violent as in false hunger. False hunger pangs are felt markedly in duodenal ulcer.

When a man fasts he lives on himself, *i.e.*, his tissues undergo autolysis and get into the blood stream. This is now taken to the appropriate organs, *e.g.*, liver and muscles, and oxidised to give the necessary energy for the working of the vital organs like heart, lungs and brain, and the maintenance of the bodily heat.

If he takes physical exercises more metabolism takes place and therefore more of his

own tissues are utilised. The glycogen which is stored in the liver and muscles is all converted within the first 2 days into glucose and utilised. Next the fat depots in the body are utilised for energy purposes. Over 97 per cent. of the body's fat is used up in a long fast. There are professional fasters who have fasted for 30 and 40 days for physiologists to study the changes that take place in the body. In the first ten days of the fast about 1 or  $1\frac{1}{2}$  per cent. of the weight is lost daily; later this percentage loss decreases. Those who had been heavy weights lose much and attain a uniform weight, at a lower level. Those who were lean before the fast soon pick up after the fast and put on weight till they attain an optimum weight at a higher level than before.

It must be remembered that the faster must get used to the switch-over of his ordinary exogenous metabolism, *viz.*, metabolism of the food he eats, to the endogenous metabolism, *viz.*, metabolism of his own tissues. The change-over must affect his mental and physical disposition, and hence the lethargy, vomiting, and insomnia of many fasters at this period. But if this fact is remembered he will take the change in an understanding spirit and will refuse to be disheartened.

There are *two kinds of energy* in our body. One is the primordial or *vital energy* called *Prana*, comparable to that of the battery in a car. The other is the *energy obtained from the food* we eat, comparable to the vapour of petrol. Western physiologists do not take into



account this vital energy and hence their inability to understand fasting as a cure and as a method of "charging" our battery. This primordial energy is obtained from the *Prana-maya-kosha* (vide next section). Undoubtedly the charging of our nerve cells, which compose our battery, with Prana takes place during deep sleep and hence our feeling of being refreshed on getting up from bed in the morning. Everyone knows that the battery must be in very good condition to give a powerful spark to act on the petrol. In an identical way our Prana is needed in full measure to utilise the energy of the food we eat.

From the "charged" nerve cells our Prana, now manifesting itself as nerve force or nerve impulse travels along nerves and sets in motion respiration, deglutition, digestion, absorption, metabolism, peristalsis, etc. Let us consider for a moment the act of respiration. The foetus in the mother's womb has the respiratory centres, which are endowed with the sovereign power of initiating inspiration and expiration; but these centres do not function till after birth. At birth the cold air impinges on the skin of the baby, and this impulse is carried from the skin through the sensory nerves to these two respiratory centres. And it is this stimulation that makes the erstwhile inactive respiratory centres to work. Now the respiratory centres send impulses through many nerves to all the muscles, concerned with inspiration and expiration, and make them to contract and relax in an ordered way;

and this act of sending impulses goes on till death. When an impulse passes along a nerve electrical changes take place in that nerve. Just as a battery has to send its current, the respiratory centres keep on sending these electrical waves throughout life. Even as a battery has to be charged the respiratory centres require charging, and this charging is done by the *Prana-maya-kosha* during deep sleep. Otherwise just as a battery will fail, the respiratory centres will also fail sooner or later. This applies to all the centres in the entire nervous system. At the end of a hard day's work we say we are tired. This tiredness is but an expression of the depleted battery. However much we may eat throughout the night the tired feeling will not go; but if we sleep well preferably on an unloaded stomach we feel exceedingly refreshed in the morning. *This refreshed feeling indicates a good charge. This is the real physical significance of sleep.* Western physiologists need this tip from the Orient.

The difference between electrical energy and the energy obtained from food is obvious. For the muscles of respiration to work food-energy is needed; and for them to work continuously the blood has to be continuously replenished with the food absorbed after digestion; (normally food is digested in the stomach and small intestine. It is now absorbed by the blood and lymph and taken to the muscles and other tissues).



Incidentally it may be mentioned that Prana is closely interwoven with the mind; Yogic exercises are meant to control the mind through the control of Prana. When the mind gets jaded the Prana suffers the same fate and the "brain's charge" is affected. Therefore it is that when we are in great sorrow all the functions of the body are at a low ebb.

*Fasting saves Prana :* How? it may be asked. In the process of digestion of the food we eat, all the salivary glands, the gastric glands, the intestinal glands which number by the million, the pancreas, and the liver which is the biggest gland in the body, must work and secrete their juices. The alimentary canal, beginning from the mouth and ending in the anus, is over 30 feet in length. Its entire musculature takes part in the movements associated with the churning of the food and its propulsion (peristalsis) through this long tube. All these require not only food-energy but also pranic energy. The faster saves the latter and hence his feeling of a new life blossoming during the fast.

It is not realised by the layman that every organ or tissue when it works produces an electric current. When an organ is diseased the generation of electricity is affected. We make use of this phenomenon in the use of the electro-cardiogram, which shows us the exact working of our heart, diseased or healthy, and in the use of the electro-encephalogram which shows the action currents of the nerve cells of the brain (*vide* Chapter XI).

*When should the fast be broken?* Medical men, *e.g.*, Dewey, Graham, Josiah Oldfield and laymen, *e.g.*, Carrington, Fletcher and fasters themselves have expressed their views on this point based on their findings. One section holds that the return of a normal appetite and hunger are the best signs for the finish of a fast, while the other maintains that a doctor is the best person to decide, since in some cases normal hunger never returns. Both views, in our opinion, have their valuable place.

*The return of normal hunger* (not the hunger pangs of duodenal ulcer) is undoubtedly an index that all the unwanted material in our body is sent out. As stated previously, normal hunger can wait, while false hunger cannot. In the latter there is an "all-gone" feeling in the stomach, while in the former there is a pleasant feeling in the throat and mouth which is, as if it were, prepared to water at the sight of a food that is desired. Before a fast is ended the coated tongue must clear up and the offensive smell emanating from the alimentary canal through the mouth must disappear. There must also be a feeling of sufficient fresh energy bubbling newly in the system. This is an index that the *battery is charged*.

But there are certain chronic cases where normal hunger will not return. For such, a doctor is the best person to weigh all the factors and decide when to stop the fast. There may be hidden diseases, caused by microbes,



*e.g.*, syphilis. These will flare up during the period of depression in a fast and kill the faster, unless a doctor, realising it, stops it. Such cases of death, when the fast is conducted by laymen, had occurred. In the case of heavy weights the lowering of one's weights to the optimum standard (*vide* Appendix III) is a good index to stop the fast. In the case of sub-normal weights this procedure is inapplicable. Short fasts, not exceeding one week, are the safest for them.

*What should be the meal at the end of the fast?* The first meal after a long fast should be liquid, *e.g.*, orange juice. Some may prefer a plate of vegetable soup. In any case the quantity should be small—say two ounces. This kind of small drink may be taken a few times during the first 24 hours. Semi-solids are allowed the next day, *e.g.*, puddings, custard, fruits like papaw, grapes, or baked apple, canjee of rice or sago, etc. Solids are advised only on the third day. The quantity must be small and the food must be well cooked.

When we consider the causation of renal colic, we know that a derangement in the metabolism is the chief factor. For example, taking too much tea, in the case of some individuals, causes an oxalate calculus to be formed in the kidneys. The cutting out of tea completely from the diet prevents any further renal colic. Exhibition of it at any stage later usually brings on the colic. But if such a person

with an oxalate-calculus-diathesis undergoes a fast under medical supervision he will completely get over the deranged metabolism and within a short time after the fast be able to take tea with impunity. In a similar way "the error of metabolism" in asthmatics can be got rid of by fasts. The "error" may arise from the fact that the battery is weak or weakened.

It may be asked when the fast should be undertaken. During the period when paroxysms are absent it is quite safe to begin a fast. During the paroxysmal period some patients are so bad that even water is not tolerated. Such may fast during times of attack, with the permission of the attending doctor; but it should be a short fast.

Fasts are of great value in those who develop dermatitis or eczema. Fasts, coupled with the general Yogic exercises, eradicate the skin lesions peculiar to allergy and asthma. Of course it is ridiculous to prescribe fasts for syphilitic rash.

Successful fasters refer not only to the disappearance of the various ailments that prompted them to undertake the fast, but also state that they feel a new vitality in their system. Let us discuss (physiological terminology is unavoidable) how this new vitality comes into being. In order that a nerve may fulfil its function completely the following components of the circuit must be in perfect order: (1) The origin of the nerve, *e.g.*, vagus nucleus or



centre, (2) The entire course of the nerve, (3) The nerve terminals and the organs in which they terminate. Fasting cleanses the organs in which the nerve terminates, *e.g.*, the stomach and intestines which the vagus supplies are cleared out of all the accumulated debris and made healthy. A healthy alimentary canal bestows enormous health on all the organs of the body. The Yogic exercises clear up Nos. 1 and 2, *viz.*, origin and the course of the nerves. So, when these 3 components of a nervous circuit are rendered healthy the cerebral impulses which were hitherto partially effective on a congested alimentary canal are now fully effective. This is partly the reason why the faster is conscious of a new life blossoming in his system (*vide* next section also).

There are quite a number of people, who are really constipated, though they boast that they have daily two and three motions. The truth of the matter in these cases is, that as soon as they have a motion, their rectum is filled by a fresh portion of faeces; in other words their rectum is never empty. This is certainly not a sign of health. Stagnation in the rectum signifies that there is probably stagnation in the rest of the large intestine and very likely in the small intestine also. When there is stagnation there will arise putrefaction of the protein and fermentation of the carbohydrates. The toxic products of these abnormal phenomena are absorbed by the blood and taken to all the tissues. Necessarily metabolism becomes abnormal. The skin is

also an excretory organ; when the abnormal products of metabolism are excreted by the skin, there is irritation and then dermatitis. A complete fast is an effective remedy for such a condition. In the case of mild eczema a partial fast is enough. If coupled with the general Yogic exercises (*vide* Chapter VIII) a partial fast is quite enough.

In a healthy person there must be no albumen in his urine. But it is well known in medicine that there is a condition called "Functional albuminuria" which does not indicate any disease. After severe exercise it is often present. Collier found it in every-one of the Oxford Crew of 1906 after rowing a course. Nervous tension is a common cause. Dukes found it in 16 per cent. of all the boys entering Rugby school at the ages of 13 and 14. The most amazing fact in all these cases is that there is no trace of albumen present in the urine passed in the morning after the night's rest. But when he gets up and assumes the erect posture for some time albumen reappears. Therefore physiologists say that recumbent posture prevents albuminuria, while the erect posture brings it on! It is also accepted that irritability of the vaso-motor nerves, and depression of mind are causes of functional albuminuria. The presence of albumen in the urine denotes an abnormal metabolism. Therefore it is clear that errors of metabolism can be caused by functional changes of the body; and an asthmatic should not be frightened by the phrase that there is an



error of metabolism in his constitution. It seems to be more reasonable to argue that the recumbent posture alone was not the responsible factor in the disappearance of the albuminuria; the charging of the "nerve cells" with sufficient Prana during the night's repose is also an important factor.

It is necessary to emphasise that the meals in the future life of the faster must be regulated with reference to time, quantity and quality, that no meal should be taken in the absence of natural hunger, and that every morsel must be well masticated. Otherwise further fasts will become necessary.

We shall close this section with a reference to 2 fasts.

**Van R. Wilcox** suffered from eczema, piles, partial paralysis, kidney disease, etc.; fasted 60 days, but during the opening and closing days took milk. He weighed 105 lbs. before the fast. After the fast he gradually put on weight up to 160 lbs. All his illnesses including eczema disappeared. He walked from New York to San Francisco in 167 days.

**Dr. I. J. Eales**, M.D. weighed 235 lbs. had albuminuria and functional disease of heart. He reduced himself by a few short fasts to 180 lbs.; heart became normal, albuminuria disappeared. At the end of a thirty-day fast he lifted a man weighing 242 lbs. without any difficulty, his senses were rendered more acute and his brain became clearer.

## Prana-maya-kosha.

The elaborate researches into the working of a muscle give us much information about the activities of our body, for every movement is brought about by the action and co-ordination of groups of muscles. The physiologists have not obtained the answers to all their queries, but sufficient is found for our study.

When we move a group of muscles voluntarily our thought puts into action certain nerve cells called Pyramidal cells situated in the motor area of the cerebrum (brain). The nerve-fibres from these cells take the message finally to the anterior horn cells situated in the spinal cord. The nerve-fibres of these cells carry the order of the thought to the muscles concerned and cause them to contract. For example in the act of writing the hand muscles are set into motion in certain ways. Incidentally it may be mentioned that every child has to be taught how to manipulate these muscles. After writing for some hours the muscles get tired and they refuse to work. In this process of fatigue it is found that the anterior horn nerve cells are the first to tire, then the muscles and only last are the nerves. Certain changes (chromatolysis) take place in the nerve cells as a result of fatigue. Rest or sleep removes these changes. Normally, in order to maintain the tone of the muscles, impulses proceed from these nerve cells, as reflex phenomena, at the rate of some 15-18 per second. For practical purposes we may say that these frequent tonic impulses do not



tire the nerve cells ; since only certain fibres of the muscle are affected at a time in this action they also are not fatigued. It is obvious that the tonic impulse is much weaker than the impulse from our thought, for the former cause only a few fibres to contract slightly while the latter causes entire muscles to contract forcibly. It would therefore appear that fatigue is caused by too frequent powerful impulses. Rest is sufficient to remove a certain degree of fatigue, but if the latter is great only sleep can remove it ; that is why we sleep. All this applies even more forcibly to the nerve cells that compose the respiratory centres in the medulla (*vide* Chapter I). These cells send impulses all through life at the rate of 15 to 20 per minute in adults (and in children at a quicker rate) to the muscles of respiration. Normally these cells must get fatigued, but it is prevented by the action of the Prana-maya-kosha during sleep.

Physiologists can only accept that sleep *removes* the chromatolysis, but what happens *during* sleep is unknown to them. Yoga says that Prana-maya-kosha gives these nerve cells, during sleep, the necessary nervous energy or prana while the blood and cerebro-spinal fluid give the needed nutriment. This action is comparable to the charging of a car-battery. The necessary chemicals (sulphuric acid, etc.) are added and the strong electric current from the "main" is passed through the battery for three days. The "main," in our physical body is the Prana-maya-kosha, and the "chemicals"

are the elements of nutrition. In other words the *nerve cells are charged during rest and during deep sleep daily.*

It is the lack of nervous energy that causes "nervous dyspepsia," "nervous breakdown," etc. Irregular action of the nervous energy causes hysteria. From the form of the aura hysteria is easily diagnosed. An extreme example of the lack of Prana in the alimentary canal is found in the mental disease called Catatony. Rosenfeld made a study of many such cases and the following quotation of his work from "Metabolism and Practical Medicine" by Von Noorden, Vol. III, 1907, p. 1245 illustrates it. "In spite of forced feeding, the rapidly diminished body weight did not respond to the quantity of food. Death from inanition could not be prevented, even with an excess of food (up to 82 calories per kilogramme) and almost perfect muscular rest and undisturbed digestion. It is remarkable that, after the recovery from the psychosis, the body weight quickly increased with a food supply much smaller than that administered by force during the illness." Here it is clear that though the patient had an undisturbed digestion and perfect muscular rest he was unable to utilise the food that was artificially put inside his stomach. Yoga holds that without the help of Prana the process of digestion, absorption and metabolism cannot take place. In Catatony the circulation of Prana in the alimentary canal was unconsciously weakened and inhibited but when the mental affliction was cured



there was neither weakening nor inhibition ; the Prana circulated in its normal intensity and therefore the processes of digestion and absorption took place normally.

A well-known English educationist, who had come to know of these subtle bodies through Theosophy, had described his experience under chloroform, when he was anaesthetised for a certain operation. He said that in his sukshma-sarira he stepped out of his physical body and was able to watch the operation. He described all that the surgeon did and his statement was later corroborated by the surgeon. There was just sufficient link between his Prana-maya-kosha and his physical body for life to still continue (in the physical body) during the anaesthesia.

Now let us consider the action of nervous energy at different levels, *i.e.*, the energy associated with weak and strong nervous impulses. The salivary glands are all the time secreting saliva, and during meals the secretion is increased. The para-sympathetic supplies these glands and when this nerve is stimulated secretion is poured. If the strength of the stimulus is increased the concentration of the saliva and the rate of secretion are both increased. For example in a certain experiment with a strong stimulus the volume of saliva was increased over four-fold while the percentage of organic substances in the saliva was raised from 0.84 to 2.06 per cent. This shows that an increased stimulus has a fuller action on a secreting gland than a weak

one. The same is true of the action of nervous impulses on muscles. Therefore a strong battery (well charged set of nerve cells) is more effective than a weak one. This applies not only to glands and muscles, but to all organs of the body.

When the glands and intestinal muscles daily are *overworked*, too many and too strong nervous impulses have to arise for this purpose. *The battery*, composed of the nerve cells of the brain, spinal cord and the autonomic ganglia is *fatigued*. During a fast the glands for the most part stop secreting, some completely, and the entire intestinal musculature is at rest. *Therefore not a little nervous energy is saved*. According to Von Noorden the energy of normal digestion is equivalent to 150-200 calories. The nervous energy needed in the process of utilising this food energy is saved; but more than this normal nervous energy is spent in the forced digestion of a glutton. All this excess is also saved.

Our life depends on this electric battery of nerve cells and the life of a battery can be definitely prolonged by regular charging; nay more, its value and service are greatly increased by regular charging. There is a daily charge even as a dynamo charges the car-battery; but a special charge is needed now and then when it (battery) is run down. For this purpose it is taken out of the car and sent to an electrical service-station. In an identical way we have to isolate our nerve cells from their usual routine of activities. We



therefore, while recommending a complete fast, maintain that the faster must also refrain from his daily avocations. He should charge his mind also with happy and elevating thoughts, and salubrious company. Yogic exercises, especially Pranayama, are of immense value at this stage, since the pranic circulation is developed. There are higher forms of yogic sadhana for increasing our fund of energy, but since they are super-physical processes mere reference to them is sufficient for purposes of this Chapter.

When an animal is anaesthetised and its cerebral cortex is led off by 2 electrodes placed on its surface and connected with a suitable amplifier and recording oscillograph, potential waves may be recorded. They are composed of large slow waves at 1-4 per second, and superimposed smaller waves. Increase or reduction of the anaesthesia may alter the magnitude of the waves. In the case of man these waves (electro-encephalograms) are detected by applying the electrodes to the human scalp. There are (1) Alpha waves which arise in the visual area of the occipital lobe of the cerebrum and which occur at about 10 per second, (2) Beta waves at about 25 per second, arising probably from the sensori-motor area of the cerebrum. During deep sleep are found the delta waves at about 6 a second. We have already studied in the first Chapter that impulses at the rate of 15-20 per minute arise continuously from the respiratory centres in the Medulla.

These facts show clearly that our brain, in addition to its other multifarious activities, also acts as an active battery. All nerve cells are miniature batteries. By means of electro-encephalograms epilepsy can be diagnosed. Kilner diagnosed epilepsy with equal certainty by the altered appearance of the aura. In one case, though the patient had the last fit 27 years previously, he spotted its existence by the classical type of epileptic aura. This suggests a close relationship between the Prana-maya-kosha (or aura) and the electric waves from the brain.

It is therefore necessary to know more about Prana-maya-kosha. According to Yoga this kosha or sheath measures in an adult six feet in height. Kilner's measurement of the height of the aura tallies with this figure. The substance of the kosha is not static. According to Kilner's experiments it is neither magnetic nor electrical in nature, but is closely related to and affected by them; it is intimately connected with the activities of the nervous system. In experiments on human beings an electric brush, when kept over the vertebral column (inside which is the spinal cord) or in front of the frontal bone (behind which is the frontal lobe of the brain), produces a great enlargement of the aura. Prana flows along the nerves and the kosha envelopes every cell of the body. Permanent diseases like epilepsy or disseminated sclerosis are associated with permanent changes in the aura, with reference to shape and quality. Temporary diseases



also produce changes, but when the diseases are cured the aura also becomes normal. There are five different kinds of prana, *viz.*, Prana (proper), Apana, Viyana, Udana and Samana. Each has its own sphere of action and colour. In Kilner's method the aura has to be examined through coloured screens, *e.g.*, dicyanin and carmine. Therefore the colours he saw are not the original colours of the aura.

The axon reflex or otherwise called antidromic impulse cannot be accounted for by modern physiology. In this phenomenon an impulse travels along an afferent nerve in a direction opposite to the usual and accepted one, and causes a dilatation of the blood vessels of the skin supplied by this afferent nerve. Yoga suggests the following explanation : when the afferent nerve going to the spinal cord is stimulated by an electric current the Prana flowing along that nerve is greatly increased. Increased pranic circulation signifies increased circulation of blood and heat in that area.

Changes in the colour of this kosha over any desired area can be effected by will ; and rays can be made to emanate outwards in a similar way from any selected point. Kilner found this capacity only in a few women ! But this is equally present in men.

Under hypnosis when passes are made over a certain area, the part of the aura concerned shrinks and becomes less bright. If that area

is pricked with a pin, there is no sensation. This is a well-known phenomenon, but its explanation depends on the alterations in the auric part affected.

If a hand is taken near another's body rays of prana can be seen going out from the finger tips to the Prana-maya-kosha of the other body. This can be observed through a dicyanin screen. When two people come near each other rays of prana at right angles to each body proceed from one kosha to the other ; the rays never bend. When there is great sympathy between both, this exchange of rays is pronounced. When one has a headache the prana over the head is seen to be congested. The healer just places his hand an inch above the site of the headache and wills that his hand should absorb all the congested prana from the patient. Immediately the headache disappears ; the healer has to throw away the 'diseased prana' by forcibly swinging his hands a few times. After this the healer, if he wants to, may pass his prana into the patient by placing his hand as before and willing that his prana should enter the patient's kosha. This passage of prana can be seen experimentally. When this transference takes place the patient testifies to a feeling of warmth over that area.

This kosha is closely interwoven with Manomaya-kosha (mento-emotional sheath) and Vignanamaya-kosha (sheath of buddhi or wisdom) and cannot be separated from them, though for descriptive purposes it is treated



separately. The three taken together is called linga-sarira or sukshma-sarira. There are six chakras or nerve plexuses, through which the Kundalini Shakti passes in its passage from the Muladhara to the Sahasrara chakra. The former corresponds to the lowest nerve plexus in the pelvis, while the latter to the 7th and highest and is in the cerebrum. As the Kundalini Shakti rises from one chakra to another the student (or sadhaka) gets an increase in his siddhis or powers, and when it reaches Sahasrara he attains, the classical eight siddhis, viz., *Anima* or becoming as small as a point, *Mahima* or becoming as big as the imagination can take, *Laghima* or becoming very light, *Garima* or becoming very heavy even as a mountain, *Prapti* or success in getting whatever is desired, *Prakamya* or capacity to enter into the body of another dead person, *Vasitvam* or capacity to subjugate or tame all living creatures, e.g., lion, cobra, and *Ishatvam* or dominion over almost anything and everything even as a Divine Being.

In some of these siddhis the Yogi works on the prana and akasa (ether) surrounding him. That is how suzerainty over the macrocosm is obtained.

A Yogi utilises prana even as a physicist uses electricity. The prana-maya-kosha is not a mere imaginary body, which should have no place in our daily physical activities. The subtler bodies have power over the physical

body. *By doing yogic exercises the prana-maya-kosha, which probably shows up the disease of asthma also, is rendered healthy and normal.*

Lest the reader distrusts the possibility of these siddhis we give just a few more of these miraculous feats. In Bombay Yogi Deshabandu, a lean man without even an average muscular development, was able to break an iron chain  $\frac{3}{4}$  inch in thickness by a mere tug of his body (*vide* Dr. Rele's "Mysterious Kundalini"). The Yogi attributed his strength to the development and control of prana by Yogic exercises. Reference to his other feats is made in Chapter II. There was another well-known Muslim Yogi who could make himself luminous at night. We know of a Yogi (called Yogar) in Ceylon, who once sent a very powerful shaft of light to a distance of some thirty miles. This was caught up by a Yogi, who was coming from India to Jaffna (in Ceylon), and he followed it to its source. (C.f., the Star over Bethlehem which the wise men of the East followed). This same Yogi once narrated to a mother in Ceylon all the mental difficulties her son was just then undergoing, while staying in a haunted house in the Isle of Wight during a vacation. Some 25 or 30 years ago a Yogi in India stopped the working of a locomotive engine, when he was de-trained for travelling without a ticket. The engine-driver and the Station-master had later to beg of the Yogi to give back the power to the steam-engine, which he did so, on condition that Yogis and Hindu Sannyasins would in future be



allowed to travel by train without tickets. To this day this privilege of free railway travel is given to Sannyasins.

In our daily lives we unconsciously use prana. Dyspepsia, in neurotics, is primarily caused by the partial, though unconscious, withdrawal of prana from the alimentary tract, especially the small intestine. Hysterical anaesthesia is caused by the unconscious withdrawal of prana from the affected skin area.

Yogi Deshabandu could stop the beat in the temporal artery while in both the carotid arteries there was the pulse beat. Rele, who examined and watched his feats, is of opinion that by the control of chakras or nerve-plexuses he exerted this control over the temporal artery. The control seems to be even finer. The control of the Vagus motor nucleus for a Yogi therefore is such that he can demonstrate it to others. In other words a Yogi can stop a paroxysm at will.

In the study of the chemical changes that take place during and after the contraction of a muscle it is proved beyond doubt that the oxidation process does not take place during the act of contraction but only during relaxation and after, and it is the oxidation process that accounts for more than half the heat produced by the work of a muscle. During the contraction itself creatine phosphoric acid and adenosine triphosphate are broken down into simpler substances and these are reformed during relaxation. Oxygen is not needed for

these two changes. Probably a certain ferment is activated by the nervous impulse, that brings on the contraction, and this ferment causes the break-down of the above-mentioned two substances. The energy released is said to provide the chemical energy needed for the mechanical energy; but "the means by which the chemical energy of the contracting muscle is converted into the mechanical energy of the contractile process is quite unknown," ("Principles of Human Physiology," Lovat Evans, 9th Edition, Page 154). According to Yoga *the prana-maya-kosha is responsible for the heat of the body*. One wonders if there is truth in this dictum of Yoga. Let us discuss this. Yoga does not for a moment deny that heat is generated during the metabolism of the food we eat. What is inferred from the Yogic teaching is that food is needed primarily to (1) provide energy for the muscular work connected with our profession or calling, (2) provide energy for the heart, circulation, respiration, etc. to go on.

*The heat generated in the above two processes is incidental (and not the primary purpose of nature)* and is utilised to maintain the body temperature. If excessive, part of it is sent out by the mechanism of the heat-regulating centre in the hypothalamus of the brain, as heat-loss. In cold-blooded animals this centre is absent.

But allopathic medical men, who have studied only Western physiology, and who are not conversant with Eastern physiology, will



have many questions to ask. So, let us go further into the subject of food and metabolism. At the outset, it must be mentioned that the respiration-calorimetric experiments on metabolism carried out in cold places like London will give results very different from the same experiments if carried out in hot places like Colombo. It is obvious that in London, where the temperature, at the time of the experiment, is say  $53^{\circ}\text{F.}$ , the subject experimented upon feels cold and necessarily loses very much more heat than in Colombo where the temperature is, say,  $80^{\circ}\text{F.}$

Therefore the basal metabolism, which represents the heat lost in 24 hours from a man in a resting condition and without food, as calculated in a London calorimetric experiment must be much more than in a Colombo experiment. This probably accounts for the difference in the figures between British and Viennese physiologists. In the experiments of Von Noorden the average heat lost per day by a fasting man was 1,550 calories while in the experiments in London it was over 2,000 calories. At a place where the atmospheric temperature is  $86^{\circ}\text{F.}$  the loss of heat from the body occurs at practically the same rate as that at which it is produced and clothing is not needed to keep ourselves warm. Therefore in places where the atmospheric temperature is higher than  $86^{\circ}\text{F.}$ , e.g., Colombo, in April, when it can be  $88^{\circ}\text{F.}$ , clothing is an encumbrance. The body is then concerned with sending out heat from its system and not

in its production or preservation. The production is only incidental in the process of manufacturing energy for our daily work. Even in cold climates, "the majority of well-to-do people, whose appetite is stimulated by their palate maintain a constant body temperature by regulating the heat loss rather than the production of heat." (Mc Dowall's *Handbook of Physiology and Biochemistry*, 1946, p. 568). Sherman in 'Food and Health' goes further and writes "In winter we attempt, by wearing heavier clothing and heating the buildings in which we live, to keep that part of the air which is in immediate contact with the skin at very nearly a summer temperature. In so far as we accomplish this we free the body from the need of burning food for the mere purpose of keeping itself warm even in winter."

Chittenden had proved beyond dispute by experiments on himself and hundreds of others, that a man can live comfortably and with maximum efficiency and health on 2,000 calories a day. Chittenden weighed 150 pounds and his experiments were done in America. In hotter places like Ceylon and India the figure has to be even less. Last April the temperature of the atmosphere in Colombo in the sun was  $120^{\circ}\text{F.}$ ! Certainly then no one would want 2,000 calories a day except the labourers, who had to do much muscular work.

To those who argue that 2,000 calories are not enough we would refer them to the valuable experiments of R. O. Neumann. This physiologist carried out numerous and exact



investigations for long periods and had conclusively proved that a man *can live on both a rich and a poor diet with maximum efficiency and without losing weight*. He lived on dietaries of 2,427, 2,777 and 1,999 calories for periods of ten, four and eight months respectively without losing weight in any of them. E. Buys gives the instance of a labourer, weighing 194 lbs., who, due to poverty lived on a maintenance diet of only 1,600 calories. We would also refer them to "Food and Health" (1948) Page 29, by Sherman.

An average man does muscular work to the extent of 100,000 kilogramme-metres or expressed as its heat equivalent 235 calories a day. The human machine can transform, as a rule, about one-fifth of the energy supplied to it in the form of food into work, the remainder being dissipated as heat. Therefore 1,000 calories, in round numbers, of energy must be supplied as food in order to enable this amount of work to be done. Within this figure is included the extra work entailed on the heart, lungs, etc. to execute this muscular work. Alwater had proved by experiments lasting many days that no energy from food is needed for brain-work; the energy needed a day was the same whether the subject did active mental work or not. Of course, the nutrition needed for the physical well-being of the brain is supplied by the blood and possibly by the cerebro-spinal fluid. The following table gives

a summary of our calorific needs in a warm climate like Colombo :—

	Calories.
(1) For external work ...	1,000
(2) For digestion, gland action, (according to Von Noor- den) ... ..	150
(3) For respiration (according to Von Noorden) ...	130
(4) For cardiac work ... ..	240
(5) Evaporation in lungs ...	366
(6) Warming air in respiration and warming water in food ... ..	64
Total ...	1,950

The heat generated in the liver and endocrine glands is unknown. There are more factors which must be considered. Even when a man is supposed to be at rest certain groups of muscles are in a contracted state. Therefore the energy so expended should also be deducted from the experimental heat loss to obtain basal metabolism. Again, we all accept that during muscular work heat is generated. When the heart pumps blood through the capillaries the friction caused in the process produces heat. When millions of impulses pass through nerves heat, though small, is generated. The changes in the nerve cells also produce heat. All this heat is utilised in the maintenance of the body temperature. When



this heat is in sufficient quantity the body has no need to produce heat specifically to maintain the body temperature. The brain and nervous system are said to require about 14 per cent. of the basal metabolic energy.

On warm days in Colombo no one likes to take the usual lunch. A fruit salad, preferably cooled, is what one prefers. The above mentioned 1,950 calories seem to be enough, except for manual workers who require considerably more. In a cold place like London Item 6 will rise to 161 calories, *i.e.*, 97 calories more, bringing the total to 2,047 calories. Chittenden's figure of 2,000 calories tallies with this figure. There is no item for loss of heat in the table. Physiologists should not be dogmatic. Over 50 years ago muscular energy was considered to be supplied by protein metabolism and equations were drawn even then to prove the law of conservation of energy. Now, carbohydrates are known to take the biggest share in this, though proteins and fats may also be utilised. There is another fact which physiologists cannot account for, *viz.*, the increase of unaccountable weight during the first few days of better nutrition after a period of complete fast. Von Noorden writes "In numerous cases observed by myself the weight added during the first week has been three times as great as that which could be attributed, even under the most favourable conditions of nutrition, to the protein and fat added to the tissues of the body." Water-retention is not enough to account for it.

Today physiologists cannot satisfactorily explain the specific dynamic action of protein and the other 2 foodstuffs. All the changes during contraction of a muscle are not yet found out. If more food is taken than is necessary for the body, putrefaction of the excessive proteins and fermentation of the excessive carbohydrates take place; more work is thrown on digestion unnecessarily and also on the kidneys for the excretion of the unwanted waste-products.

The figures given by us are only suggestive ones to enable one to understand the significance of the Yogic theory. The usual textbooks on physiology do not give the calories needed for respiratory work or for the work of the nervous system. Even where the respiratory work is given the amounts needed for the work of the lungs, and for the muscles of respiration like the diaphragm, inter-costals, trapezius, pectoralis major and minor, etc. are not separately given. Von Noorden puts down the respiratory work as equivalent to 130 calories while in Kellog's "New Dietetics" it is put down at 30 per cent. of the basal metabolism. Again Starling puts down the work of the heart at 10,000 kilogramme-metres while Von Noorden at 17,352 kilogramme-metres, and Mac Leod at 15,000 kilogramme-metres. British Physiologists maintain that 50 per cent. of the total protein must be of animal origin (milk, cheese, mutton, etc.) while Sherman and quite a few others with exact figures point out that one-tenth only of the total



protein in-take should be of animal origin ! Under these circumstances we have to wait, till physiology is more advanced, to come to more definite conclusions.

In order to clarify the place of Prana-maya-kosha in our daily activities we shall consider any one movement, say, that of writing. In this act a few muscles of the hand take part. Each muscle contracts only when an impulse comes to it along the nerve that supplies it. *The muscle contracts and the oxygen is used during the relaxation of the muscle. The oxygen is not wanted to produce the contraction.* For this one phenomenon we require (1) *Nervous energy* (or pranic energy) of the impulse to the muscle (2) *The physical contraction* of muscle, (3) The chemical changes that take place during and after the relaxation (here the oxygenation takes place), (4) *The brain* which sends the impulses at the same time to a certain number of muscles, (5) *The thought* which tells what to write.

Modern physiology deals proficiently with (3) and (4) and to a less extent with (2). When it comes to (1) and (5) there is a jumble ! We have shown earlier that the nervous energy comes ultimately from the Prana-maya-kosha and that thought is a product of the Vignana-maya-kosha, which is inseparable from the Prana-maya-kosha. It was the great physiologist Virchow who said that thought is secreted by the brain just as bile is secreted by the liver ! The inter-relationship between nervous and

chemical energy, as suggested by such physiologists, cannot have much profundity. There is no formula to convert chemical energy into nervous energy. Nervous energy is different from chemical energy and comes from the Prana-maya-kosha and not from food. In support, to some extent of our contention we quote from Claude Bernards' "Physiological Light" the following :—

"Arrived at the termination of our studies we see that they lead us to a very general conclusion, the result of experiment ; namely, that between the two schools, one holding that vital phenomena are absolutely distinct from physico-chemical phenomena, the other, that they are wholly identical with them, there is a place for a third doctrine, that of physical vitalism, which takes account of what there is peculiar in the manifestation of life, and what there is that conforms to the action of general forces ; the ultimate element of the phenomenon is physical, the arrangement is vital."

Clairvoyants tell us a little more than embryologists. In the laying down of the autonomic nervous system in the foetus they are able to see the force emanating through the Mano-maya-kosha (mento-emotional sheath) and descending through the Prana-maya-kosha and then through the anterior fontanelle to about the centre of the head, from where it runs towards the throat and chest ; while in the building of the central nervous system they see the force emanating through the Vignana-maya-kosha (wisdom or thought sheath



then through the Prana-maya-kosha and anterior fontanelle to the foramen magnum from where it runs down the direction of the spine. In either case the force concerned comes from the Ananda-maya-kosha, but before it enters the physical body it vivifies the Prana-maya-kosha. This clairvoyant information shows that the autonomic nervous system, as part of its work, subserves our emotions, while the central nervous system subserves our will and thought. When we read an uninteresting book or listen to a boring lecture we feel easily tired. Surely the using up of calorific energy is not the cause, for if we go out for a long walk soon after these we feel very refreshed. Physiologists must take into account these other energies, *viz.*, mental and emotional also and not limit themselves to mechanical, chemical and electrical energies.

In the shock treatment that we give to cases of puerperal insanity and allied psychoses, it appears as if the Prana-maya-kosha is exercised by this treatment. Here we pass a powerful electric current for a fraction of a second through the nervous system of the patient. She becomes unconscious and after a couple of minutes regains consciousness. Her condition after a shock-treatment is better than before. A series of such treatments (about 12) given once in four days or so completely cure the insanity in many cases.

In an application of static electricity from a whimshurst machine to the nervous system the aura was found to increase in size by about

50 per cent. In a couple of days it regained its normal size.' This shock treatment therefore seems to develop the Prana-maya-kosha. This in turn interacts on the brain-cells and takes a share in rendering their functions normal. The effect of the electric current directly on the brain-cells is not quite known. In the laboratory study of the action of electric current on nerve cells (*e.g.*, of 3rd cranial nerve nucleus) it is found that there is a subnormal excitability of these cells for a relatively long period (30 m. secs.) after the passage of an electric current through them. This finding does not help us in this enquiry.

In experiments done on cats with electric shocks it was found that the cortical cells of the brains were damaged. Obviously the current was too strong. Senanayake is of opinion that no valuable information could be obtained from such experiments. He shares the view with certain other psychiatrists that the benefits of the electric shock treatment is probably due to the tonic influence of this treatment on the ductless glands specially the pituitary. Therefore of all the experimental evidence the increase in size of the Prana-maya-kosha seems to be the most important cause of the improvement in the mental condition of the patients.

It is said that, when Brother Martin de Porres' body was exhumed after 25 years for burial elsewhere, his body felt warm (and blood exuded when pricked with pins). It is also recorded that when a Yogi, who was



buried underground, was unearthed accidentally during the Indian Mutiny the pick-axe of the soldier had fallen heavily on the Yogi; he bled, but he blessed him with the words "Tat Twam asi," *i.e.*, "Thou art He." Such occurrences cannot be taken to the laboratory of the Physiologist, but he (*i.e.*, physiologist) should look out for such phenomena and give them due place before he draws his deductions. Obviously there was heat in the Yogi's body, though he was without any kind of food for probably years.

The instance given in the Footnote on Page 43 of Chapter II confirms this. When Kundalini Shakti rises from the Muladhara Chakra (lowest nerve plexus in the pelvis), through the Sushumna (central canal of the spinal cord) heat is produced first in the region of the vertebral column and later in the whole body. The author knows a Yogi, who, unable to bear the excessive heat so produced, had to immerse himself in a river for some days and nights without a break. Both Kundalini and Prana signify Primordial Energy. The heat so generated seems to be analogous to the heating of a wire in a bulb by an electric current. Buddhist books, *e.g.*, *Chos-drug* (Tibetan) give as the first of the six doctrines 'Vital-warmth' or Gtum-mo. Every Buddhist aspirant in Tibet must in the early stages master this Yogic process of keeping himself warm in the coldest weather with neither food nor clothing.

From this study of the Prana-maya-kosha we learn that we should not be so dependent on food as it obtains today. We should order the food needed to meet the demands of the vital organs, *viz.*, heart, lungs, brain, etc. and of the physical work we have to do. When the physical work is less the food consumed should be correspondingly small. Incidentally we learn a great spiritual lesson, *viz.*, that we are not these physical bodies, but that each physical body is merely a temporary abode or medium, through which one can express one's will, wisdom and activity and also receive in the same coins from others during a varying span of life. This is a valuable conviction to enable us to realise the possibility, nay probability, of soothing the irritable vagus nuclei.

In conclusion the author wishes to state that what is expounded here is an ancient Yogic theory and not his.



## CHAPTER XI.

### A. ASTHMA—ITS ACCEPTED MEDICAL ASPECTS.

Every asthmatic wants to know the cause of asthma and whether it can be completely cured. The cause of malaria is the malarial parasite; that of phthisis the tubercle bacillus; that of enteric fever the typhoid bacillus; but of asthma there is no such clear-cut cause; there is no organism that is the cause of asthma, we now deal with. There is a disease called Asthmatic Bronchitis. Here the disease is bronchitis, but because the breathing resembles asthma it is so named. The treatment in this illness should therefore be primarily directed against bronchitis. But it must also be remembered that an asthmatic may be secondarily attacked by bronchitis. Therefore the treatment in such a case should be directed at both. In these, medicines for bronchitis should be taken. There is again that dire disease tuberculosis; one of its outward manifestations is paroxysms like asthma. An X-Ray photograph of the lungs immediately clinches the diagnosis. In asthma there will be hardly anything noticeable, but in tuberculosis the characteristic lesions are depicted in the photo. The additional examinations like that of sputum for tubercle bacilli and sedimentation test will help in the diagnosis.



It goes without saying that the treatment should be for tuberculosis and not for asthma.

In the very first chapter we have referred to cardiac asthma and renal asthma. In the former, changes in the heart with all the signs and symptoms of a diseased and failing heart are present. The spasm is more noticeable during inspiration than in expiration. In renal asthma there are changes in the urine, *e.g.*, albuminuria, changes in the retina, *e.g.*, retinitis and uraemia. Medical treatment should be given for the respective illness.

We are here concerned with bronchial asthma or spasmodic asthma, as it is sometimes called. There is no fever, unless bronchitis sets in as a complication. The chief distress lies in the paroxysms and cough.

Some get paroxysms on inhaling dust-proteins like dandruffs from the coats of cats, horses, dogs and poultry, pollen from certain plants, saw-dust, etc. The proteins (not the toxins) of infesting organisms, *e.g.*, streptococcus viridans, pneumococcus, micrococcus cattarrhalis are also responsible for paroxysms in not a few. That is why auto-vaccines are prepared and injected though the results are not sufficiently encouraging. There is also the psychological factor, *e.g.*, terrible anxiety, which plays a great part in the causation of the paroxysms. The following case-record from "Text Book of Medical Treatment," third Edition by Dunlop, Davidson & McNee,

is given below for the reader to assess the merits of the various alleged causes.

"A boy aged sixteen, the son of brilliant parents, had had periodic attacks of severe asthma since the age of six. He had eczema in infancy and there was a family history of asthma on his father's side. Skin tests were positive to horse and cat hair, dust and pollen, but negative to all ingestants tested. He had received many kinds of treatment including non-specific desensitization. His feather pillow had been replaced by one of sorbo-rubber. Periodic attacks of asthma continued just the same. Our analysis of the events immediately preceding the attacks made it clear that anything which induced a state of nervous tension would precipitate an attack. Recently the boy's mother telephoned one of us that he had severe asthma. Inquiry elicited the information that he had been having examinations for the preceding three days; an assurance that the attack would immediately subside without any treatment when the results were announced, particularly if he had done well, were justified by its immediate cessation on the following day when the boy was given first class honours. It is difficult to know to what degree the conscious or unconscious mind was responsible for the attack. The state of nervous tension induced by the examinations could not be avoided by the brilliant youth. On the other hand, the occurrence of asthma at the time of the examinations would be a good excuse if he failed to do well, while if he were successful



the accomplishment would be all the more creditable, in view of his physical incapacity. Some two weeks after the examination, when the boy was entirely free from asthma, we repeated his skin tests and found them triple positive to the above-mentioned inhalants. At the same time, tests performed on his three brothers and sisters, who were non-asthmatics, were negative. The clinical history of eczema and the family history of asthma, together with the positive skin tests, suggest an undoubted allergic factor. Nevertheless, the boy is free from asthma for months on end, despite the presence of cats in the house or even when he is sleeping on feather pillows. If an allergic factor in this case is the cause of the asthma, it would appear to operate only or chiefly when a state of nervous tension is induced by psychological causes."

In children, who are subject to asthma, round worms precipitate a paroxysm. Fright often induces in such children paroxysms. Pelvic disturbances in women induce attacks. These are said to be reflex causes of asthma. Again many asthmatics are subject to urticaria or eczema. When these skin manifestations are present they are free from asthma, but when they disappear paroxysms appear.

The mucous membrane of the nose is continuous with that of the bronchioles. The mechanism of the allergic phenomenon is as follows: When dust proteins, *e.g.*, pollen from grass impinge on the nasal mucous membrane of a potential asthmatic or hay-fever patient

this mucous membrane gets inflamed, *i.e.*, it gets turgid and swollen and secretes much mucus. This necessarily blocks the nasal passages and therefore nature causes sneezing (hay-fever sneezing) continuously till the passages are cleared of the mucus. After forty (40) the nasal mucous membrane gets tired out by this continual hay-fever inflammation and loses its function of arresting the dust proteins. Therefore the same dust proteins enter the bronchial tubes and produce the same phenomenon, *viz.*, swelling of the mucous membrane and excessive secretion of mucus. The bronchial walls contract spasmodically (spasmodic asthma) to send out the mucus. This is the usual explanation given to show why hay-fever patients develop asthma in middle life. In the case of children, who suffer from asthma, this explanation is not quite satisfactory; the dust proteins reach the bronchial tubes without being arrested by the nasal structures. However, the conclusion of Modern Medicine is that *inheritance* is the chief factor in determining whether or not a patient will ever develop hay-fever or asthma!

In the Eighth Chapter, Section D, we have shown how a strong current of air as, *e.g.*, in Bhastrika, led through one nostril at a time completely clears out all this mucus and restores the mucous membrane to normality. These regular breathing exercises make the mucous membrane so strong that they prevent it from suffering inflammation at the hands of the dust proteins. The same applies to the mucous



membrane of the bronchial tubes. Our practices send out the mucus from these tubes and by giving it regular toning exercises restore it to health.

When asthmatic attacks continue for many years the bronchial mucous membrane suffer chronic inflammation and reach a deteriorated and atrophic state towards the later stages. In order to prevent this catastrophe one should take to these exercises early.

The value of breathing exercises and heliotherapy is recognised by Modern Medicine though relatively recently. But the system of exercises given here is unknown to modern allopathic doctors of the West and we claim a much higher place for the Yogic system in the treatment of asthma than the place they give to *their system of physical exercises*.\* These latter exercises do not seem to consider the possibility of controlling the vagus or respiratory centres.

The effect of medicines on asthma is well known. Take adrenalin injection for example. It gives prompt but temporary relief. After sometime the body seems to get used to it and it refuses to answer.

This is the case with all drugs in asthma. The disease seems to want newer drugs every-time and there is no end to this drug habit.

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\* "Physical exercises for asthma." (Asthma Research Council, King's College, London).

Asthmatics frequently ask doctors if there isn't any new drug introduced lately.

It is accepted that the digestive system should be overhauled. Where doctors give medicines our exercises tone up and massage all the organs of digestion.

It is also accepted that a certain condition in the nose requires treatment. There is an area in the nose which in asthmatics is abnormally sensitive to dust, cold air, etc. When that area (asthmagenic area) is irritated by cold air or dust proteins an asthmatic paroxysm is reflexly caused. There is a similar sensitive area in the larynx most marked just below the glottis which produces a paroxysm when the air from the lungs impinges on it during exhalation or when the atmospheric air impinges on it during inspiration. Drug applications are clumsy and difficult. In our system air is forced to rush past these sensitive areas under great pressure and they get desensitised with the necessary practice in these breathing exercises. The functional activities of the parts concerned are put right by these exercises (*vide* Chapter III). The nervous causative factor for this abnormal sensitivity is removed.

In the blood there are two classes of cells, viz., red cells and white cells. Among the latter are found cells called eosinophiles which form in normal blood 2 to 4 per cent. of the total white cells. In asthma it is increased



up to 30 per cent. We had the case of a young asthmatic girl of seven who had it at 85% ! Her asthma was indeed very severe and chronic. A medicine called carbarsone is widely used amongst other medicines for such cases. It does temporary good but it is a dangerous drug unless prescribed by a doctor.

### B. Author's Views.

Modern Medicine tends to consider allergy as the prime factor in the causation of asthma. Allergy is an unusual response to an ordinary stimulus. It is due possibly to a chemical factor—an *inborn error* of metabolism; and also to a *relative over-action of the parasympathetic*. In the case of asthma the parasympathetic referred to is the vagus nerve. Voluminous literature is now forthcoming from the hands of specialists and not a little energy is required for such research work; its results may be summarised in the following pithy lines. "In one case where the patient was shown to be sensitive to cereals, excluding them from his diet was followed by a dramatic improvement. Some months later, however, the attacks recurred and the tests were repeated. He was now no longer sensitive to cereals, though he was to a number of other substances that had previously produced no reaction" (Langdon Brown & Hilton).

It would therefore be more profitable to consider the nature of the overactivity of the vagus and the 'inborn error' referred to above.

Why are the vagus nerves overactive in asthma? and this quality also is inborn. Are there other diseases where a set of nerves is overactive innately? Yes, the motor area in the cerebrum and the pyramidal tracts are overactive in epilepsy. It is now accepted that epilepsy is due to a sudden motor discharge of nervous energy from the cortical cells of the motor area of the brain, though some authors are still slow to do so. The pyramidal tracts convey these impulses to the various muscles. In diseases which cause obstruction to the path of these nerve impulses, *e.g.*, haemorrhage in the internal capsule, epilepsy in that half of the body supplied by that affected pyramidal tract is abolished. This confirms the aetiology of epilepsy.

In the case of asthma the broncho-motor portions of the vagus nuclei are in an irritable condition. It is worth while studying the similarities between epilepsy and asthma and if the similarities are overwhelming, it is not unreasonable to consider more seriously if there is an innate abnormal activity of the vagus centres in asthmatic subjects or those with an asthmatic diathesis.

These two diseases run in families. Always another asthmatic or epileptic can be spotted among the near relatives. In both the nervous element is accepted. Epilepsy is caused by a sudden discharge of nervous energy from that part of the brain called the cerebrum. If the motor area of the cerebrum is stimulated contractions of all the muscles



of the body as in epilepsy take place. If the vagus motor centre in the medulla is stimulated asthmatic paroxysm is produced.

The age and sex factors in both asthma and epilepsy are identical. Both commonly start in infancy, and less commonly after 10 years and still less after middle life. Both sexes are equally affected in the early ages but the males are more affected in later ages. This is common to both asthma and epilepsy. There are in both premonitory symptoms before the attack. The premonitory symptoms in asthma are not sufficiently realised. Asthmatics often have a headache, mental depression or excitement, tightness in the chest or a funny feeling which only asthmatics know before the attack. The premonitory symptoms in epilepsy are similar and more. We shall soon explain why there is a difference in the premonitory symptoms.

The electro-encephalograph is a device which records the action currents produced by the electrical activity of cortical nerve cells. Epileptics show a definite pattern as those in heart disease show a different but definite pattern in an electro-cardiogram. Several days before the fit the instrument records the epileptic pattern and it is found that 10% of the entire population gives this pattern though all do not get epileptic attacks; this shows that they are all liable to epilepsy; that is why some get epilepsy in middle life.

The same is true of asthma. \* In Ceylon there is just now no electro-encephalograph. It may be possible to show action currents in the cells of the vagus centres. We know in practice that there are many potential asthmatics. It is they who flare up with asthma in middle and late life. We know of one very old lady who developed asthma for the first time after seventy-five (75). Epileptiform attacks and asthmatic paroxysms occur in other diseases, *e.g.*, in uraemia, which occurs in the advanced stages of kidney diseases. In tumours of the motor areas of the cerebrum epileptiform convulsions take place. In tumours of the medulla, that there is irregularity in respiration is accepted. Sufficient research is not yet done in connection with tumours about the vagus nerve origins.

Convulsions can be brought about in an epileptic child by reflex causes, *e.g.*, worms. In the same way a paroxysm can be induced in an asthmatic child by similar reflex causes, *e.g.*, worms. In both diseases fright produces attacks.

From these rather close similarities we may reasonably conclude that asthma is caused by an abnormal reaction of the irritable vagus motor nuclei in the medulla to the various stimuli that reach them.

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\* This apparatus is already ordered for by the Ceylon Government, but has not yet arrived.



In the light of this aetiology of asthma the psychological factor can be understood. There is an intimate nervous connection between these medullary centres and the cerebrum where our thought processes originate in the physical plane. The cerebrum, being the area for all the highest centres, has full power and control over the lower centres. For example, if the two visual centres in the occipital lobes of the cerebrum are affected, our vision is equally affected though every part of the eyes may be normal. Here by our will through the cerebral centres (*vide* Chapter I) we control the vagus centres in the medulla. This explains the difficult points in the example cited in this Chapter. The fear of the examination results made the cerebrum to stimulate the vagus centre to activity and hence the paroxysm; but when the results of the first class honours reached him the boy's happiness through the cerebrum inhibited the abnormally functioning vagus centre and so the paroxysm ceased. We know of an asthmatic patient of ours who swore that, when he was under the care of another doctor (who is since deceased) he used to take ices freely without having paroxysms even during his illness. His faith in that doctor's word was so great that through his cerebrum he inhibited the vagus centre from reacting to the reflex action caused by the ices. There are a few faith cures of asthma which are permanent. Here the great faith has worked through the cerebrum and permanently inhibited the activity of the irritable vagus centre.

The following table summarises the similarities between asthma and epilepsy :—

### Asthma.

### Epilepsy.

1. *Age.* Incidence : Starts commonly in infancy. Starts less commonly in middle life.

2. *Sex.* Both sexes equally affected in the young. More males in later life. Rare in old age.

Bray gives a different set of figures.

3. *Heredity.* Runs in families. Near relatives have this illness. Runs in families.

4. *Results of experimental stimulation.* Electric stimulation of vagus centre in medulla or vagus nerves produces asthma.

Runs in families. Near relatives have this illness. Runs in nervous families. Electric stimulation of motor area of cortex or motor tract produces epileptic fits.



5. *Premonitory symptoms.* Present: headache, tightness and heaviness in chest, general depression, often mental excitement and passing of large quantities of urine.

6. *Presence of nervous factor.* Patients are very nervous.

7. *Psychological factor.* Severe anxiety produces paroxysm.

8. *Effect of reflex causes.* Worms, fright, etc. produce in children paroxysm.

9. *Electro-Encephalogram.* This is not yet done to show the action currents of cells of vagus centres. Some apparently healthy people develop asthma in middle life. Clinically we know the presence of asthmatic diathesis in such apparently healthy people.

Present: headache, general depression. Aura present. Often mental excitement and passing of large quantities of urine.

Very nervous.

Severe anxiety produces fit.

Worms, fright, etc. produce in children fits.

This is done already and by this means we can detect an impending fit days before the attack. 10% of the entire population show this special pattern. That is why people get attacks in middle life. Electro-encephalogram shows epileptic diathesis.

10. *Symptoms of illness are appropriate to affection of vagus centres.*

11. *Effect of tumours.* Tumour in medulla causes irregularities in respiration and cough as in asthma also. There is room for research in this direction.

12. *Results of treatment.* Not satisfactory. Liable to recur. Very few completely recover.

13. *At menopause* asthma often gets worse.

14. *Faith cures.* A very few are completely cured by faith.

15. *Is the disease organic or functional?* It is functional.

16. *Causation.* Probably abnormal functioning of the vagus centres.

Symptoms of illness appropriate to affection of motor area of cerebrum.

Tumour in motor area of cerebrum causes epileptic fit.

Results not satisfactory. Liable to recur. Very few completely recover.

At menopause fits recur more often.

A very few are completely cured by faith.

It is functional.

Sudden discharge of nervous energy from motor area of cerebrum.



17. *Can we control?*

(a) By drugs—yes, up to a point.

(b) By faith—yes, in very few.

(c) By ourselves—yes, because the cerebrum which is higher than the medulla can control it even during a paroxysm.

The patient can exert great control through the cerebrum. Through our exercises we effect this necessary control. When there is a tendency to cough during the exercises it is by means of the cerebrum that we *will* not to cough.

18. Allergens produce asthma.

We have referred earlier in this chapter to certain asthmagenic areas. It is a form of hypersensitiveness or hyperaesthesia in technical terminology. Hyperaesthesia is found

in hysteria and anxiety neuroses. It is universally accepted that asthma is associated with nervous tension and that it runs in 'nervous' families.

The asthmagenic area in the nose begins with the lower margin of the middle turbinal and includes the ethmoid and the areas adjacent to it both of the septum and outer wall.

The other asthmagenic area is in the region of the glottis especially marked below it. This does not seem to be recognised by the medical profession as an asthmagenic area, but in our experience we consider it to be even more sensitive than the nasal one. This is supplied by the sensory fibres of a branch of the vagus. When cold air or mucus or dust proteins stimulate it the sensory impulses are carried by the vagus to the vagal motor nucleus which reflexly send impulses to the bronchial muscles causing paroxysm or cough. The asthmagenic area in the nose is supplied by branches of the fifth cranial nerve, the nucleus of which lies adjacent to the motor nucleus of the vagus. When this asthmagenic area is stimulated by dust proteins, the sensory fibres of the fifth nerve carry these impulses to the motor nucleus of the vagus, which in turn send impulses to the bronchial muscles causing a paroxysm.

If the respiratory and vagus centres function normally there may not arise the possibility for the existence of these asthmagenic areas.



Asthma is an inherited disease. It would seem that in all those, with an asthmatic diathesis, the bronchial muscles undergo spastic contractions of a mild degree throughout their lives. Only now and then these spasms become acute causing the asthmatic paroxysm. The mild spasms may be compared to the rhythmic contractions of the uterus during pregnancy while the strong spasms to those of labour. On account of these constant, though mild, spasms of the bronchi and bronchioles the intake and output of air is less than normal. To prove this theory of ours, we give the following cases for comparison :

A girl aged 16 years, height 5 feet, weight 112 lbs. has a vital capacity of only 1,000 cc. She is robust and healthy. Her only defect was that as a baby she had a few attacks of asthma. She now plays tennis, attends physical drill at school regularly and keeps herself fit. She has no bronchitis. Her younger sister aged 13, height 5 feet 2½ inches, weight 122 lbs. has a vital capacity of 1,600 ccs. She had a few attacks of bronchitis between her 6th and 7th year but no asthma. Her younger brother aged 11 years, height 4 feet 6½ inches, weight 66 lbs. has a vital capacity of 1,000 ccs. He has no asthma but is subject to cold and cough often.

To estimate the vital capacity the subject is asked to take the biggest inspiration and exhale forcibly into the mouthpiece of a spirometer. The vital capacity of an average adult

varies from 2,500 ccs. to 5,500 ccs. In the case of athletes it may rise to 10,000 ccs. Every asthmatic will do well to periodically test his or her vital capacity till it reaches the normal level, and then test it on and off to ensure that the normal vital capacity is maintained.

The above shows that a robust girl of 16 has only a vital capacity of 1,000 ccs. while a younger sister of 13 has a vital capacity of 1,600 ccs. ; and a younger brother of 11 has a vital capacity of 1,000 ccs. The only difference is that she, as a baby, had asthma, while the other two are asthma-free. The asthmatic factor definitely decreases the vital capacity even though for many years one is asthma-free.

The following comparison proves the same contention. An adult aged 37, well nourished, muscular, with chest still of normal shape and size, plays 6 sets of singles at tennis vigorously and skilfully, but subject to severe asthma, has during health only 1,600 ccs. of vital capacity.

His elder brother, aged 48, well nourished, less muscular has a vital capacity of 2,100 ccs. ; but he is asthma-free. Many such comparisons may be given to illustrate it.

During asthma the volume of inspired air is very small and when asthma becomes chronic the chest assumes a more or less distended position (barrel-shaped) that it enlarges but little during an inspiration ; it contracts



during expiration even less. This accounts for the small vital capacity in a confirmed asthmatic. But in the case of one who had asthma 15 years ago, it would seem that there is a spasm, though probably mild, of the bronchial tubes that the normal volume of air is neither drawn in during inspiration nor sent out during expiration. This would mean that the vagus centre is causing such spasms. Therefore our theory that asthma is caused by an abnormal activity of the vagus centres stands to reason.

Again, it is well known that when eczema intervenes asthma disappears and *vice versa*. Various other neuroses and even attacks of insanity or *epilepsy* may alternate in the same way (Saville). In general practice one comes across, on and off, few instances of epilepsy where asthma suddenly would intervene for a few years, when the epilepsy would disappear; and when the asthma would disappear the epilepsy would return,

It is recognised that there is an inborn error of metabolism in asthma. The Chapter on Diet deals with food that need be excluded during the illness. But we have also noted that the so-called 'disagreeable' food varies in the same individual from time to time. Therefore an attempt must be made to know the cause of this 'inborn error' and to remove it. According to Modern Medicine this error is caused by a lack of histaminase (the nature of which is discussed in the next section). It is also known that the presence of histamine in

the blood calls forth a secretion of adrenalin, which neutralises it. Our exercises increase the secretion of adrenalin and therefore the error in metabolism is rectified.

By suggestion especially in hypnosis the asthma-producing effect of an allergen can be inhibited. Hansen has demonstrated it by letting his patients inhale the specific allergen during hypnosis and preventing the development of asthma by suggestion. The suggestion employed by the hypnotiser works through the cerebrum on the vagus centre and inhibits the over-activity of the vagus. It is claimed by the opposition party that at a later stage the asthma reappears. Probably if the hypnotic suggestion is repeated often enough it will not reappear. We, however, are of opinion that submitting oneself to another's will during hypnosis is unhealthy and therefore put forward as an alternative our system of Pranayama, which is wholesome and independent of another's mesmerising influence.

Balyeat gives 2 cases where epileptiform convulsions were produced by allergens; he further points out that on withdrawal of the specific allergens epileptic fits disappeared for as considerable a period as sixteen months. On return of the parties to normal diet the epileptic seizures recurred. There is on record quite a number of such cases. This fact proves our contention all the more, *viz.*, that asthma and epilepsy are allied diseases and that they are both functional.



## ASTHMA AND ECZEMA.

It may be asked why an eczematous rash sets in when asthma disappears in certain individuals and *vice versa*. If histamine is applied to the human skin it immediately causes a rash. If it is injected into the vein of an animal it causes anaphylactic shock and asthma. If it is injected intradermally (*i.e.*, into the skin) it causes a wheal. *Histamine* is a toxic substance produced from the protein of the cells of the body. In asthmatics this substance is set free from the cells without being quickly neutralised by the ferment *histaminase*, which is congenitally deficient in these patients. If it is liberated in the bronchial tubes it causes asthma. Histamine is present in the dandruff of horses. We had cases of allergic eczema involving practically the entire body. Adrenalin cured them in a miraculous way almost. Our exercises do this work to a certain extent.

Langdon Brown and Hilton in "Physiological Principles in Treatment", 8th edition (1943) defines asthma, improving upon Hurst's definition, as due to an unstable or irritable condition of the broncho-motor portion of the vagus nucleus, which causes it to react unduly to psychical or peripheral stimuli, or to foreign proteins. They discuss this issue in a very straightforward manner setting at naught other definitions. Every word of theirs supports the author's view on the causation of asthma.

A few words about reflex action and its control are needed to enable lay readers to

appreciate our theory. During sleep if one pricks our hand with a pin we immediately take our hand off without knowing anything about it. This is a reflex action. When the bladder or rectum is full a baby immediately releases reflexly his urine or faeces; but by education this is controlled and an adult can always defer the call for micturition or defaecation. In the first case the pin prick is the stimulating cause, and the spinal cord is the centre which causes the reflex response to take place. In the other two the stretching of the muscle fibres by the distended bladder and rectum provided the stimuli, and the spinal cord is the centre. In asthma the horse's dandruff (containing histamine) acts on the nasal mucous membrane (in the asthmagenic area) and stimulates the 5th cranial nerve, which takes this impulse to the vagus motor nucleus. This irritable nucleus acts as the centre and sends impulses through the vagus nerves constricting the bronchial muscles. The histamine may also enter the blood circulation under certain stimuli and stimulate the vagus motor centre. We have shown in the case cited early in this Chapter that this allergic reflex stimulation was completely inhibited (stopped) by his powerful mental stimulus of joy over his first class honours. We have already referred to other stimuli, like worms or mental fear of failing an examination, as stimulating causes.

It is argued by some that the irritability of the vagus centre is not primary but is caused



rather by excessive histamine circulating in the blood. There are cases of eczema, where a parent is asthmatic, without their ever contracting asthma. The eczema is definitely allergic in character. The excessive foreign protein in their blood does not produce asthma, nor vagus irritability in those cases ! The reason seems to be, as Dale has shown, that the histamine in blood calls forth the secretion of adrenalin which neutralises its action ; but this cannot apply in all cases.

The sympathetic is below par in certain cases of asthma. This fact is not given sufficient importance. In our system of treatment we give prominence to those Yogic exercises that tone up the thoracic and cervical sympathetic. The recent World War was the cause of many cases of asthma, acquired in middle or late life. Unexpected crash in business or profession was the immediate cause of the lowering of the tone of the sympathetic nervous system and asthma resulted. In asthmatics, enuresis and a spastic colon are not uncommon. These may be due to a disturbance of the fine balance between the para-sympathetic and the sympathetic either by the exaggeration of the former or the lowering of the latter.

The Ayurvedic conception of asthma and the author's modification of the same are already given in the last Chapter. These Yogic exercises belong to Ayurveda and therefore there is no need to discuss further the Ayurvedic theory.

## CHAPTER XII.

### EPILOGUE.

Every intelligent reader would have found enough material in the last 11 chapters to convince him or her of the rationale and efficacy of our system. The very simple fact, that the air we inhale and exhale goes through one nostril more easily than the other at any given-time and that it changes periodically from one side to the other, is not mentioned in text-books of human physiology of the West. A stray medical treatise may mention it ; on the other hand Yoga has observed this as the alpha in the study of respiration and had evolved "Pranayama."

It is by manipulation of this breath and the two nervous systems, *viz.*, autonomic and central that a Yogi is able to do miraculous feats (*vide* Chapter II). He can put out of action any one nostril for the passage of air for any period of time at will.

The mucous membrane of the nose secretes a thick viscid fluid normally. Its daily output varies from 12 to 18 ounces. The nose is supplied by the central and autonomic nervous systems. The latter is composed of the parasympathetic and the sympathetic





nervous systems. When the<sup>e</sup> parasympathetic is irritated or is in a state of hypertonus (vagotonia), this secretion is increased and the erectile tissue which is predominant over the inferior turbinate and adjacent part of the septum as well as the inferior edge of the middle turbinate erects itself; that is, its cavernous blood vessels fill with blood and the bulk of the mucous membrane increases enormously. It may almost close the nasal cavities. When the sympathetic is stimulated (sympathetico-tonia) the reverse takes place; there is less secretion and the erectile tissue is in abeyance. In vagotonia there is spasm of the involuntary muscles while in sympathetico-tonia there is relaxation of these same muscles. When there is secretion in one nasal chamber the other is in abeyance; the same is true of the swelling of the erectile tissue. There is also a periodicity in these two factors, which accounts for the more free passage of air through one nostril at any given time. The normal function of the entire respiratory mucous membrane and involuntary musculature depends on the maintenance of a proper balance between the parasympathetic and the sympathetic. Where the tone of the sympathetic is lowered the *general exercises* depicted in Chapter VIII, especially *Sirshasana* and *Matsyasana*, and our special exercises increase it. We have just studied that the vagus nuclei are unstable and irritable in asthma. Our *special exercises* depicted in Chapters II to VI give us control over them.

The reader may verify for himself the truth of the following. Any morning at 4 or 5, the breath goes out more freely through one nostril—the left in the majority of cases. At 6 or 7 a.m. it will be found to go more freely through the other, *viz.*, right. In the course of the day this will be found to change periodically. This is true of the eustachian tubes also. A Yogi can verify it (*vide* Chapter VIII, Section D). It is interesting to know that the breath passes more freely through the right nostril at the start of the day. The sunrise need not be at 6 a.m. sharp. It varies from 5-30 to 6-40 a.m. in Ceylon.

I am glad to mention that in 1927 the Asthma Research Council was formed in Great Britain and a system of physical exercises was evolved and placed before the public. However, it is evident, that the Research Council has not been able to refer to the original work of Yoga systems, which were evolved at least eleven centuries ago. It gave me great pleasure to notice the principle of Bhastrika incorporated in one of their exercises. But the principles of Ujjayi and Kumbhaka, which form the key-stone of the Yogic exercises, find no place. There is a depth and dignity in these (Yogic) exercises which I would like the members of the Asthma Research Council to see and examine for themselves. The cure of asthma to a Yogi is child's play.

But a word of caution is needed. In ancient days when the Kings gave their gracious patronage to Yogic schools they flourished and



were conducted as regularly and systematically as the ancient universities of Taxasila and Nalanda. Thirumoolanayanar in his "Tirumanthiram" refers to Patanjali as one of \*eight great Yogis. There is evidence to prove that Patanjali had given his approval to Svatomarama's "Hatha-Pradipika." India and Ceylon had groaned under many conquests during the past few centuries and these Yogic schools suffered greatly. The great ones had retired to the fastnesses of mountain caves and forests. As recently as 1935 a Yogi took a lion with him along the streets of Benares and a few other towns only to demonstrate to the people that one, who has conquered one's mind, has conquered a lion also. Soon after that, he retired to his jungle-cave in the Himalayas. In the known civilised world it is almost impossible to find one who can explain all the terms given in "Tirumanthiram." The same is true of the Sanskrit works. A Professor of English cannot explain a technical word like "Parasympathetic" without the help of an Anatomist. In the same way only advanced Yogis can do justice to the terms found therein. This is particularly true of the terms used in the exercises given to obtain the eight great Siddhis or Powers, *e.g.*, Power to fly or to traverse through walls, etc. However, the terms used in the exercises, given in this book, are not difficult of interpretation. The ancient Yogis knew medicine well and were highly educated, *e.g.*, Thirumoolanayanar is

\* Besides himself and Patanjali, the others are the 4 Kumaras, Sivayogamuni and Viyagrabadhar. These were famous Yogis.

the author of the medical treatise "Guna-vakada-nool."

The modern available Yogis are for the most part not well educated. With the advent of Swaraj we hope the old flourishing conditions of Yogic schools will soon return. We do find every now and then an illiterate or a semi-educated Yogi possessed of immense powers. Such men talk exceedingly little and refuse to explain their own miraculous feats, much less to teach. Eager students try to learn from them and pass on what they have learnt. When such students teach these exercises to asthmatics, mistakes are bound to be made and emphasis is put on the wrong place, especially so, since they are not doctors. We cite here a case to show this: A middle aged lady from Bombay is an asthmatic for many years. She had taken treatment from the best specialists of Western Medicine, Homeopathy and Ayurveda without any permanent benefit. She decided to try these Yogic exercises and underwent training under two 'Yogis.' They gave her no relief. Her Bombay doctor advised her to go to Bandarawela for a change, but from the first day onwards at Bandarawela she fell very ill with acute paroxysmal attacks of asthma. She had to come to Colombo for more expert medical attention. We gave her one injection on the day of arrival, and a few tablets of Franol. She had an atomiser and permission was granted for its use. We showed her these four special exercises. At the start she was overwhelmingly averse to taking any



Yogic exercise since she obtained no relief in Bombay from them. She recovered very quickly indeed in Colombo. She was fit enough to go out shopping on the third day. The following omissions and commissions were found in the Yogic training she had in Bombay :—

- (1) Our very first exercise 'Ujjayi' was not taught at all; not being doctors they probably did not know the value of Ujjayi for asthma.
- (2) The principles of Kumbhaka were not pointed out to her. Perhaps the 2 Yogis are not themselves aware of them all.
- (3) Uddiyana was taught very well, but she did it too often and maintained the expiratory phase too long; that means she was overstimulating the expiratory centre. Therefore her asthma got worse. Only two rounds of this exercise should be done, otherwise the antidote recommended in Chapter VI should be practised.
- (4) Bhastrika was taught in a mechanical way, without the explanation of its principles.
- (5) Our fourth exercise in Chapter V was not taught, since it is not one of the ancient classical exercises.

- (6) She was taught to put a little table salt {unmeasured} in hot water and to suck (breathe in) this water through the nostrils and throw out the same by the mouth. This was done by her many times.

A non-asthmatic may do this, even though the method is wrong, without much harm; but an asthmatic should never attempt it except under the supervision of a doctor. This was a stimulating cause for her paroxysms. The salt solution should be normal saline, since no other strength is iso-tonic with the tissues of the nasal passages. If the water is hot one should remain indoors for an hour; but if water at the temperature of the body is used no such precaution is necessary. The hypertonic salt solution irritated her mucous membrane, especially the asthmagenic area, and a paroxysm resulted each time she did it.

We have not referred in our main text to this well-known Yogic method of cleaning the nasal passages, since such mistakes are easily made. The powerful currents of air in Bhastrika clear up these passages sufficiently well that there is no need to resort to this method.

This lady told us that Mr. Nehru, a former Minister of Kashmir, and an uncle of Premier Nehru, cured himself of asthma by these Yogic exercises; she had lessons from him also.

We give just three cases to show the efficacy of our system.



## Case 1.

*Medical man*, middle-aged, with extensive practice, suddenly developed severe bronchial asthma in 1942. The acute attack lasted a month. Many sleepless nights were spent without being able to lie on bed. Cough was also troublesome. The only history of lung disease was when he was 19—pneumonia. He was tired of medication. The four special exercises were taken at our suggestion. He never had a paroxysm since, nor has he taken a grain of medicine in any form for asthma during the past 8 years. However he felt wheezing not infrequently for years, whenever he took a cold bath early in a dewy morning or when the weather changed; had cough when he laughed or talked much. These symptoms also were cured by taking the exercise given in Appendix I. He later developed a chronic dermatitis. We advised him to practise the yogic asanas depicted in Chapter VIII and to do a partial fast. The dermatitis disappeared in 10 days.

## Case 2.

*Baby girl*, developed asthma in first month of life. Gave her sunshine baths in the open for many hours daily till she was two years old. In the Tropics sunshine baths are sufficiently rich in ultra-violet rays and therefore sunbaths were not resorted to. The number of bottles of mixture given by us for asthma would not have exceeded six at the most. After her first year she is completely free from asthma for the past 15 years.

## Case 3.

*Business man*, aged 37, height 5 feet 6 inches, weight 154 lbs. Developed asthma in 1933 when he was 20. He had a very severe and complicated attack. Bedridden for nearly a year. Diagnosis of asthma was made only after 5 months!

In 1935 had a second attack, bedridden for 1 month.

In 1941 had a third attack, bedridden for 2 months.

In 1943 had a fourth attack, bedridden for 5 days.

In 1947 had a fifth attack, bedridden for 1 month.

In 1950 he was about to get an attack. He began our special exercises for the first time. He practised the 1st exercise "Ujjayi" well, practised another minor exercise resembling Bhastrika which we showed. Successfully prevented the attack, though the tussle lasted 10 days. The prevention has at the time of writing lasted eleven months.

During this period of 10 days he did his business transactions from home, without attending office, cut short his diet and practised one only out of these four exercises. He did not get any paroxysm. He was so impressed by these exercises that he asked for the other



three. His avidity was so great that in 10 *minutes* he learnt all the exercises in Chapters II to VI.

In 1947 we attended him professionally for the first time and treated him with medicine and many injections. It was a very severe attack, each paroxysm lasting several hours. We introduced these breathing exercises. He was sufficiently interested to learn the 1st exercise and another one not given in this book. When he was about to get the attack this year (1950) he began practising it more seriously than before and averted the attack completely and most successfully. There was no need for him to study the general exercises given in Chapter VIII, nor to fast.

We have not the slightest objection to anyone, who wants to try our system, taking medicines. If slight wheezing is present a Franol tablet may be taken or the atomizer used before beginning the exercise. Riddobron is an excellent inhalant. If bronchitis be present it must be medically and properly treated. It should not be allowed to become chronic.

With reference to bronchial asthma we must truthfully observe, that medical treatment does, as a rule, only allay the disease and in a few cases give permanent relief for a period of some years only. Therefore we would fervently ask our readers to approach our treatment as depicted in the foregoing 11 chapters with an open mind. This system

is new to the West and very few ayurvedic physicians know anything about it, though it is entirely an ayurvedic method. Before the days of ante-natal hygiene maternal and infant mortality were high. Now every intelligent mother goes to a doctor for ante-natal care and treatment. In the same way, we suggest that *every opportunity should be given to an asthmatic to become familiar with these exercises, the selection of beneficial foods and the value of sunbaths*. Every hospital and clinic should have a special out-patient department to demonstrate these. Then the number of the so-called incurable asthmatics will be brought down to the very minimum and these will be composed mainly of cases not of pure bronchial asthma but of asthmatic bronchitis, asthma complicated by bronchitis, tuberculosis with asthmatic breathing, cardiac asthma and renal asthma. All of the first two classes and a part of the 3rd are curable. Today the majority of bronchial asthmatics are classed as incurables and they have in despair accepted the situation as inevitable!

Every intelligent man recognises the existence of evil. Evil should be considered only as an impediment to be got over for the acquisition of strength. This is nature's way. We claim that here is a method of converting the weakness of asthma into the strength of a sunny life. Incidentally three scourges of humanity, viz., tuberculosis, diabetes and kidney disease are prevented by the practice of our system. No tubercle bacillus can find shelter



or flourish in a healthy pair of lungs, that are being fully and completely exercised daily. The sun's rays to which the body is regularly exposed will further strengthen the lungs. The bacillus may lodge only in parts of a lung that had never distended fully or in a lung that is permanently over-distended by impure air. The pancreas, the organ that produces insulin, and the kidneys are massaged by our exercises so well that failure on their part to cope with conditions that may abnormally arise is practically impossible, especially with our advice on diet and fasting. All the other organs of the abdomen are also well massaged and toned up; so are the heart and every part of the lungs.

*To recapitulate:* Asthma, according to our view, as explained in Chapter XI is caused principally by an abnormal activity of certain cells of the vagus centres, and in some cases by a lowering of the tone of the sympathetic. By virtue of the exercises depicted in the foregoing chapters we have attained the necessary mastery over the two respiratory centres, the two vagus centres and through them the bronchial muscles and the bronchial mucous membrane. These exercises have also increased the tone of the sympathetic and increased the secretion of adrenalin and pituitrin. Therefore we have cured asthma. We have also increased our health and strength greatly by all these exercises and hardened ourselves. But for asthma these exercises would never have been

studied nor practised. Therefore we are justified in assuring every sufferer that his despair is converted by our system into the fulfilment of strength and health, and that he is transformed into a robust and hardy man with the sunshine of health ever increasing in its magnificence and splendour. He is ever more heir to the pleasure and perfume of a happy healthy life.

Shanti ! Shanti !! Shanti !!!



## APPENDIX I.

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### Eradication of Potential Asthma.

When the weather changes asthmatics feel the change long before an ordinary man feels it. On a warm day some hours before it begins to rain an asthmatic can foretell the oncoming shower. He feels slightly heavy in the chest when the humidity changes. His chest is an accurate weather-meter. This sensitiveness may remain even after all the prescribed exercises are taken, though he is completely free from the paroxysms. It shows that 'a remnant root' of asthma is still there. It seems to be due to a peculiar sensitive state of the vagus centres though it may be argued that it is due to the asthmagenic areas. However, the fact remains that he is still a potential asthmatic. There is a way of removing this last trace also, but the remedy takes into consideration the man as a whole and not man as a mere physical organism. It takes into consideration our emotions, mind and spirit even as Ayurveda does. Modern Allopathic medicine does not, as a rule, include the last within its fold, and the average reader seems to agree with that view. Therefore we publish that method, whereby even the last potential vestige of asthma is removable, as an Appendix here.



The nerves concerned with speech include the vagus, and they all arise from the medulla, while the speech centre itself is in the cerebrum. We send an impulse from the speech centre to these nerves whenever we want to speak. Therefore an area (approximating the vagus centres) in the medulla is brought into activity in this phenomenon.

We pronounce the word of God (we use the words "Om Shivayanama") during inhalation and Kumbhaka in all the exercises. In doing so we should not pronounce loudly, but instead, keeping the lips closed, recite mentally to ourselves without making the slightest sound, this mantram. The vibrations of this mantram, coupled with our faith in the omnipotence of God, whose name we utter, remove the abnormal vibrations of the vagus centres and make them normal, as normal as in a healthy individual; at the same time the pneumotaxic centre in the Pons and the respiratory centre in the Medulla are tuned to normality. There is quite a large number of potential asthmatics, who develop asthma late in life. These potential asthmatics may be placed in the same category as those asthmatics, who have got over their asthma by practising the exercises prescribed by us. Both these classes would like to be quite normal. This exercise is meant for that purpose.

Instead of "Om Shivayanama" we may use "Om" coupled with the name of any Ishta Deva, e.g., Hari.

Non-Hindus may just chant the word "Om" and think of God. Buddhists may chant "Om" and think of the "Eternal Dhamma."

The significance and effect of sound is not sufficiently recognised today. In our elementary school books, we read of a bridge in England that collapsed, when a battalion of soldiers marched over it with steps kept to time. C. W. Leadbeater could feel in Rangoon the effects of the 'Gyatri' when chanted in Madras.

The effect of the sound "Om" requires investigation by physicists. Yogis consider this to be the first sound in the creation or manifestation of the Universe. This word (Om) is called "Pranava" (c.f. Pranayama). To build a new rhythm in the vagal area of the medulla we strongly advise the mental chanting of this "Pranava" during Pranayama. Ayurveda recognises the use of "mantras" as a therapeutic measure in certain diseases. In the recent elephant kraal held in Ceylon in August, 1950 a ten-footer wild elephant was perched on a tame elephant and was goring the latter with his tusks. During this act, single-handed, Sir Francis Molamure, with only the assistance of mantras, drove the wild elephant by throwing just one small stone at him! Therefore we heartily commend to those who have *Faith* to chant this mantram "Om" in the way we have suggested.



Sounds produce forms. The modern gramophone and ediphone are based on this. Some sounds create beautiful and pleasant forms, while others horrible and irritating ones. Mental chanting produces mental forms, which through Prana affect the physical. In Sarvangasana or Viparitha-karani or Sirshasana one remains for some minutes. This is also an excellent time to mentally chant these mantras.

Our civilisation has fortunately bequeathed to us various powerful mantras. Some of them are extremely useful to sublimate our animal instincts. The mind of a sufferer is often too weak to effect this. The human partakes of the animal and the divine. Mantras are invaluable for us to become divine, and divinity implies control over our brain centres.

## APPENDIX II.

### Summary of Exercises for Each Sitting.

#### Special for Asthma.

(1) Ujjayi—for a beginner, 7 rounds without retention of breath. This may be done at any time anywhere.

After a few weeks of practice of the above, 7 rounds with retention or Kumbhaka at the end of inspiration should be practised. Then kumbhaka should be done at the end of expiration in a less number of rounds.

Every week 3 rounds may be added to each sitting till 28 or more rounds are done at a time. 100 to 200 may be done for a day. Ujjayi with retention should be done at least 4 hours after a solid meal or 3 hours after a liquid meal. The period of duration is not given, since it may be done in the car, or in the office.

(2) Bhastrika—3 rounds, of 10-20 expulsions each. In each round the number of expulsions may be increased to 50 or 100. At the end of the last expulsion an inspiration is taken, at the end of which, retention is done; last a deep expiration. Time: 3 minutes.



(3) Uddiyana—2 rounds. This should be begun after a certain degree of proficiency is attained in (1) and (2). It should be done on an empty stomach, preferably early in the morning. In Yoga it is treated as a Bandha. Uddiyana modified by the author—3 rounds; Time : 3 minutes.

(4) Author's Exercise—3 rounds. This should be done at least 6 hours after a solid meal or 3 hours after a liquid meal. It is best done early in the morning on an empty stomach. (The 2nd exercise of the author is a minor one, done whenever cough is troublesome). Time : 3 minutes.

It is valuable to have a 2nd sitting either in the evening or just before retiring. Mornings and nights are most convenient for busy people.

The greater the time spent on these exercises the greater will be the benefit. The appearance of distress is an indication to stop the exercises for that sitting.

*These special exercises are alone enough to cure most cases.*

### For General Health and Asthma.

For beginners: Viparitha Karani, Matsyasana, and Ardha-Matsyendrasana.

Later: Sarvangasana and Sirshasana also.

For more advanced pupils: Nauli also.

Time for each exercise: Each turn 15 seconds to 3 minutes. 3 turns for each exercise. Best time is in the morning.

Healthy fatigue indicates cessation of exercise.

### *Least time for a sitting:*

Bhastrika and author's exercise 6 minutes.

Sarvangasana or Viparitha Karani, Matsyasana and Sirshasana ... 6 minutes.

Total ... 12 minutes.

Ujjayi may be practised in the car or office or while walking.

### *Longest time for a sitting:*

Ujjayi, Bhastrika, Uddiyana and author's exercise ... 12 minutes.

Sarvangasana or Viparitha Karani, Matsyasana, Sirshasana, Ardha-Matsyendrasana and Nauli ... 12 minutes.

Total ... 24 minutes.

After the cure of asthma a longer period may be given.



## APPENDIX III.

### COMPOSITION AND ENERGY VALUES OF COMMON FOODSTUFFS.

Foodstuffs.	Proteins in grm. per oz.	Fats in grm. per oz.	Carbohy- drates in grm. per oz.	Energy in Calories per oz.	Calcium in mgm. per oz.	Iron in mgm. per oz.
<b>Cereals, etc.</b>						
(Pearl) Barley ...	2.8	0.5	20.4	97	4.2	0.6
(White) Bread ...	2.3	0.2	15.6	73	5.6	—
(Brown) Bread...	2.4	0.4	14.5	72	—	—
Maize (Corn Meal), 95% ...	2.6	0.6	14.9	95	4.5	0.3
Millet ...	2.7	0.8	22.0	95	5.6	0.8
Milled Parboiled Rice ...	1.8	0.1	22.5	98	2.8	0.3
Milled Raw Rice	1.8	0.1	22.2	97	2.8	0.3
Wheat Flour, 70% ...	2.3	0.3	21.5	98	5.6	0.3
Wheat Flour, Whole ...	3.4	0.5	20.5	99	11.2	2.1
<b>Pulses.</b>						
Bengal Gram ...	4.9	1.5	17.4	104	54	2.8
Black Gram ...	6.5	0.3	16.9	97	56	2.8
Green Gram ...	6.2	0.3	16.4	93	40	2.5
Ground Nut (Pea-nut) ...	7.6	11.2	5.8	156	14	0.5
Massur Dhal ...	7.1	0.2	16.6	100	31	1.6
Peas, Dried ...	6.4	0.3	15.3	89	20	1.2
<b>Roots, etc.</b>						
Beetroot ...	0.5	—	3.5	17	8	0.3
Carrots ...	0.3	—	3.0	23	23	0.5
King Yam ...	0.5	—	7.2	31	10	—
(Bombay) Onion	0.3	—	3.3	14	51	0.2
(Small) Onion Red ...	0.5	—	3.7	17	11	0.3
(Cassava) Manioc	0.3	—	10.4	38	14	0.3
Potato ...	0.5	—	6.5	28	3	0.2
Palmyra Root (Dried) ...	1.1	—	21.5	93	—	—
Radish ...	0.3	—	2.8	11	14	0.1
Sweet Potato ...	0.4	—	8.5	36	6	0.3
Tapioca, Arrow- root Flour ...	0.5	—	22.7	96	—	—



COMPOSITION AND ENERGY VALUES  
OF COMMON FOODSTUFFS.

Foodstuffs.	Proteins in grm. per oz.	Fats in grm. per oz.	Carbohy- drates in grm. per oz.	Energy in Calories per oz.	Calcium in mgm. per oz.	Iron in mgm. per oz.
<b>Nuts, etc.</b>						
Almond...	5.9	17	3.0	170	65	1.0
Cashew Nut ...	6.0	13	5.8	160	14	1.4
Coconut ...	1.3	12	3.7	125	3	0.5
Gingelly Seeds...	5.2	12	7.2	160	410	3.0
Ground Nut ...	7.6	11	5.8	156	14	0.5
<b>Milk Foods.</b>						
Buffalo's Milk ...	1.7	2.2	1.4	28	57	—
Cow's Milk ...	0.9	1.1	1.4	19	34	—
Goat's Milk ...	1.1	1.1	1.4	20	40	—
Human Milk ...	0.5	1.1	2.0	19	9	—
Hard Cheese ...	7.1	9.7	—	110	240	—
Soft Cheese ...	3.4	5.1	0.6	60	23	—
Butter ...	—	23	—	210	—	—
Ghee ...	—	28	—	250	—	—
Curd ...	0.9	0.9	0.6	13	34	—
<b>Flesh Foods.</b>						
Bacon ...	1.4	21	—	195	2.7	0.3
Lean Beef ...	5.1	2.6	—	44	3.3	1.1
Canned Beef or Corned Beef...	7.1	4.5	—	69	5.1	1.1
Lean Mutton ...	4.6	2.5	—	41	3.1	0.8
Lean Pork ...	5.9	2.5	—	48	3.1	0.5
Freshwater Fish	5.1	0.7	—	27	5.6	0.2
Sea Fish ...	4.5	0.3	—	21	5.6	0.2
Small Dried Fish	20	0.9	—	85	185	3.4
Shell Fish ...	5.1	0.4	—	26	28	0.2
Eggs ...	3.7	3.2	—	44	16	0.8
<b>Vegetables, etc.</b>						
Cabbage ...	0.4	—	—	7	8	0.3
Beans (in Pods)	0.8	—	2.1	10	14	0.7
Brinjals...	0.3	—	1.7	8	6	0.4
Drumsticks ...	0.6	—	1.3	10	8	1.5
Jak Fruit ...	0.7	—	7.9	34	8	0.5
Jak Fruit Seeds	2.0	—	11.0	52	15	0.3
Ladies Fingers	0.6	—	1.5	7	26	0.4
Green Fresh Peas	2.0	—	5.6	31	6	0.4
Plantain (Green)	0.4	—	6.9	29	8	0.2
Plantain Flower	0.4	—	1.7	10	38	—
Spinach (Ceylon)	0.5	—	—	8	43	0.9
Gotukola ...	0.8	—	—	14	68	2.7

COMPOSITION AND ENERGY VALUES  
OF COMMON FOODSTUFFS.

Foodstuffs.	Carbohy- drates in grm. per oz.	Energy in Calories per oz.	Vit. A.	Vit. C.
<b>Fruits.</b>				
Apple ...	4	16	—	+
Bael Fruit ...	6	24	—	+
Banana ...	10	43	—	+
Dates ...	19	83	++	—
Figs ...	5	21	+	+
Grape Fruit ...	2	9	—	+
Grapes ...	3	13	—	+
Guava ...	4	19	—	+++
Jambu ...	6	24	—	—
Lemon ...	3	16	—	++
Lime ...	3	17	+	++
Mango ...	4	16	++++	+
Mangosteen ...	4	17	—	—
Watermelon ...	1	05	—	+
Orange ...	3	14	++	++
Palmyra ...	1.8	8	—	+
Papaw ...	2.7	11	+++	++
Peaches...	2.2	11	—	+
Pears ...	3.3	13	—	—
Pineapple ...	3.4	14	—	++
Plantain ...	7.0	29	—	++
Plums ...	2.5	11	++	+
Pomegranate ...	4.1	18	—	+
Raisins ...	22	90	—	—
Strawberry ...	2.8	12	—	++
Tomato (Ripe) ...	1.5	6	+++	—
Woodapple ...	4.4	27	—	—
Tamarind ...	19	80	—	+

## Abbreviations :

Vit. = Vitamin.

+ = Present.

++ = Moderately Rich.

+++ = Rather Rich.

— = Absent or Negligible.



# APPROXIMATE CALORY VALUES OF FOODS IN COMMON SERVINGS.

<i>Food.</i>	<i>Calories.</i>
Almonds, Chocolate, 5 ... ..	100
Apple, 1 average-sized ... ..	100
Asparagus, 10 large stalks with butter ...	150
Bacon, 4 small slices (cooked) ... ..	100
Banana, an average-sized ... ..	100
Beef, serving of 4 ozs.. ... ..	200
Bread, average slice ... ..	70
Butter (enough for 4 slices of bread) 1 oz. ...	210
Cabbage, raw, 1 oz., shredded, $\frac{1}{2}$ cup... ..	15
Carrots, average serving ... ..	40
Cashew Nuts, 10 good sized nuts ... ..	100
Cauliflower, average serving... ..	25
Celery, average serving ... ..	15
Cheese, 1 oz. ... ..	110
Cherries, 10 large ... ..	50
Chestnuts, 7 average-sized ... ..	100
Chicken, roast, average serving ... ..	100
Chocolate Cake, average serving ... ..	200
Chocolate Malted Milk, large glass (10 ozs.) ...	460
Cream, thick, 1 tablespoon ... ..	60
Cucumber, a large one ... ..	50
Dahl (Massur), 1 oz. ... ..	100
Dates, 4 ... ..	100
Egg, 1 ... ..	70
Fig, 1 ... ..	50
Fish, Sea, 1 oz. ... ..	20
Fowl, 1 oz. ... ..	45
Gram, Bengal, 1 oz. ... ..	105
Grape Fruit, one-half ... ..	70
Grape Fruit, one-half, with sugar ... ..	140
Grape Juice, 4 ozs. ... ..	100



Grapes, 5-oz. bunch	...	...	100
Guava, 1 large-sized, 2 ozs.	...	...	40
Hopper, 1 large-sized	...	...	100
Lemon, 1	...	...	30
Lettuce with salad dressing, average serving	...	...	125
Macaroni, dry, 1 oz.	...	...	100
Mango, 1 large-sized	...	...	170
Mangosteen, 1 oz.	...	...	17
Mayonnaise, 1 table-spoon	...	...	100
Milk, 1 glass	...	...	150
Mutton, 1 oz.	...	...	100
Oatmeal, 1 oz.	...	...	110
Olive, 1	...	...	15
Onion, 1 oz.	...	...	12
Orange, 1 big	...	...	100
Papaw, one-quarter, 5 ozs.	...	...	50
Peach, 1	...	...	35
Peanut or Groundnut, 1 oz.	...	...	150
Peas, one serving	...	...	50
Pineapple, one serving, 4 ozs.	...	...	50
Plums, 4	...	...	100
Pork, fat, 1 oz.	...	...	150
Potato, 1 (2 ozs.)	...	...	45
Potato Chips, 10 large ones	...	...	100
Prune, 1	...	...	25
Raisins, 1 oz.	...	...	90
Rice, dry, 1 oz.	...	...	100
Rice Pudding, $\frac{1}{2}$ cup	...	...	200
Salmon, canned, 1 oz.	...	...	50
Spinach, 1 oz.	...	...	9
Strawberries, $\frac{1}{2}$ cup	...	...	65
Sugar, 1 oz.	...	...	110
Sweet Potato, 1 oz.	...	...	036
Tomato Fruit, 1 large ( $\frac{1}{2}$ lb.)	...	...	60
Walnut, 1 oz.	...	...	190
Watermelon, 1 oz.	...	...	5
Wheat, breakfast food, dry, 1 oz.	...	...	100
Woodapple, 1 medium-sized	...	...	100
Yam, King, 1 oz.	...	...	30
Yam, King, serving with coconut and sugar	...	...	200

**N.B.**—(1) In season, in Ceylon and India many consume daily a half dozen mangoes on the top of their normal food, *i.e.*, 1,000 calories more. By the end of the mango season they should look for a surplus weight of 30 lbs. or for *sugar in the urine*. When intelligence is not applied to Dietetics this is the result.

(2) *The calcium* requirement of an adult is 0.5 gramme, of an adolescent (13-18 yrs.) 1 gm., of children 0.8 gm., of an expectant mother 1 gm., and of a nursing mother 1.3 gm. per day. All pulses, all milk foods, some roots and nuts and some leafy vegetables are rich in calcium.

(3) *The Iron* requirements of an adult is about 10 milligrammes per day.

(4) *Cellulose* in foods is necessary to increase the bulk, which mechanically stimulates the peristalsis (*i.e.*, movements of contraction, which propel the food further) of the intestine, and causes evacuation of the bowels. Bran, seedy fruits, greens and legumes are rich in cellulose. Bananas, which contain only 1.5 grain of cellulose in 1 oz., seems to be a much better laxative than grapes or cabbage, which contain 7.5 grains and 9.2 grains per oz. respectively. Obviously further investigation is necessary on this point. The kind or quality of cellulose may be a factor.



TABLE OF HEIGHTS AND WEIGHTS IN LBS.  
FOR CEYLONESE AND SOUTH INDIANS.

Age	4-10	4-11	5-0	5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	6-0
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TABLE OF HEIGHTS AND WEIGHTS  
HEIGHT IN INCHES AND WEIGHT

AGE IN YEARS	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"	40"	41"	42"	43"	44"	45"	46"	47"	48"	49"
3	23	23	24	24	25	26	26	27	28	29	30	31	32										
4					26	27	28	29	30	31	32	32	33	33	34	35							
5							29	30	31	32	33	34	34	35	36	37	38	39					
6									31	32	33	34	34	35	36	37	38	39	41	42			
7										33	34	35	35	36	37	38	39	41	43	44			
8												35	36	37	38	39	40	42	44	45	46	48	50
9													36	37	38	39	40	42	44	45	46	48	50
10													39	40	41	43	45	46	47	49	51	53	55
11																			44	45	47	49	51
12																				46	48	50	52
13																						52	54
14																							56
15																							58
16																							
17																							
18																							



Age	4-10	4-11	5-0	5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15	5-16	5-17	5-18	5-19	5-20	5-21	5-22	5-23	5-24	5-25	5-26	5-27	5-28	5-29	5-30	5-31	5-32	5-33	5-34	5-35	5-36	5-37	5-38	5-39	5-40	5-41	5-42	5-43	5-44	5-45	5-46	5-47	5-48	5-49	5-50	5-51	5-52	5-53	5-54	5-55	5-56	5-57	5-58	5-59	5-60	5-61	5-62	5-63	5-64	5-65	5-66	5-67	5-68	5-69	5-70	5-71	5-72	5-73	5-74	5-75	5-76	5-77	5-78	5-79	5-80	5-81	5-82	5-83	5-84	5-85	5-86	5-87	5-88	5-89	5-90	5-91	5-92	5-93	5-94	5-95	5-96	5-97	5-98	5-99	5-100	5-101	5-102	5-103	5-104	5-105	5-106	5-107	5-108	5-109	5-110	5-111	5-112	5-113	5-114	5-115	5-116	5-117	5-118	5-119	5-120	5-121	5-122	5-123	5-124	5-125	5-126	5-127	5-128	5-129	5-130	5-131	5-132	5-133	5-134	5-135	5-136	5-137	5-138	5-139	5-140	5-141	5-142	5-143	5-144	5-145	5-146	5-147	5-148	5-149	5-150	5-151	5-152	5-153	5-154	5-155	5-156	5-157	5-158	5-159	5-160	5-161	5-162	5-163	5-164	5-165	5-166	5-167	5-168	5-169	5-170	5-171	5-172	5-173	5-174	5-175	5-176	5-177	5-178	5-179	5-180	5-181	5-182	5-183	5-184	5-185	5-186	5-187	5-188	5-189	5-190	5-191	5-192	5-193	5-194	5-195	5-196	5-197	5-198	5-199	5-200	5-201	5-202	5-203	5-204	5-205	5-206	5-207	5-208	5-209	5-210	5-211	5-212	5-213	5-214	5-215	5-216	5-217	5-218	5-219	5-220	5-221	5-222	5-223	5-224	5-225	5-226	5-227	5-228	5-229	5-230	5-231	5-232	5-233	5-234	5-235	5-236	5-237	5-238	5-239	5-240	5-241	5-242	5-243	5-244	5-245	5-246	5-247	5-248	5-249	5-250	5-251	5-252	5-253	5-254	5-255	5-256	5-257	5-258	5-259	5-260	5-261	5-262	5-263	5-264	5-265	5-266	5-267	5-268	5-269	5-270	5-271	5-272	5-273	5-274	5-275	5-276	5-277	5-278	5-279	5-280	5-281	5-282	5-283	5-284	5-285	5-286	5-287	5-288	5-289	5-290	5-291	5-292	5-293	5-294	5-295	5-296	5-297	5-298	5-299	5-300	5-301	5-302	5-303	5-304	5-305	5-306	5-307	5-308	5-309	5-310	5-311	5-312	5-313	5-314	5-315	5-316	5-317	5-318	5-319	5-320	5-321	5-322	5-323	5-324	5-325	5-326	5-327	5-328	5-329	5-330	5-331	5-332	5-333	5-334	5-335	5-336	5-337	5-338	5-339	5-340	5-341	5-342	5-343	5-344	5-345	5-346	5-347	5-348	5-349	5-350	5-351	5-352	5-353	5-354	5-355	5-356	5-357	5-358	5-359	5-360	5-361	5-362	5-363	5-364	5-365	5-366	5-367	5-368	5-369	5-370	5-371	5-372	5-373	5-374	5-375	5-376	5-377	5-378	5-379	5-380	5-381	5-382	5-383	5-384	5-385	5-386	5-387	5-388	5-389	5-390	5-391	5-392	5-393	5-394	5-395	5-396	5-397	5-398	5-399	5-400	5-401	5-402	5-403	5-404	5-405	5-406	5-407	5-408	5-409	5-410	5-411	5-412	5-413	5-414	5-415	5-416	5-417	5-418	5-419	5-420	5-421	5-422	5-423	5-424	5-425	5-426	5-427	5-428	5-429	5-430	5-431	5-432	5-433	5-434	5-435	5-436	5-437	5-438	5-439	5-440	5-441	5-442	5-443	5-444	5-445	5-446	5-447	5-448	5-449	5-450	5-451	5-452	5-453	5-454	5-455	5-456	5-457	5-458	5-459	5-460	5-461	5-462	5-463	5-464	5-465	5-466	5-467	5-468	5-469	5-470	5-471	5-472	5-473	5-474	5-475	5-476	5-477	5-478	5-479	5-480	5-481	5-482	5-483	5-484	5-485	5-486	5-487	5-488	5-489	5-490	5-491	5-492	5-493	5-494	5-495	5-496	5-497	5-498	5-499	5-500	5-501	5-502	5-503	5-504	5-505	5-506	5-507	5-508	5-509	5-510	5-511	5-512	5-513	5-514	5-515	5-516	5-517	5-518	5-519	5-520	5-521	5-522	5-523	5-524	5-525	5-526	5-527	5-528	5-529	5-530	5-531	5-532	5-533	5-534	5-535	5-536	5-537	5-538	5-539	5-540	5-541	5-542	5-543	5-544	5-545	5-546	5-547	5-548	5-549	5-550	5-551	5-552	5-553	5-554	5-555	5-556	5-557	5-558	5-559	5-560	5-561	5-562	5-563	5-564	5-565	5-566	5-567	5-568	5-569	5-570	5-571	5-572	5-573	5-574	5-575	5-576	5-577	5-578	5-579	5-580	5-581	5-582	5-583	5-584	5-585	5-586	5-587	5-588	5-589	5-590	5-591	5-592	5-593	5-594	5-595	5-596	5-597	5-598	5-599	5-600	5-601	5-602	5-603	5-604	5-605	5-606	5-607	5-608	5-609	5-610	5-611	5-612	5-613	5-614	5-615	5-616	5-617	5-618	5-619	5-620	5-621	5-622	5-623	5-624	5-625	5-626	5-627	5-628	5-629	5-630	5-631	5-632	5-633	5-634	5-635	5-636	5-637	5-638	5-639	5-640	5-641	5-642	5-643	5-644	5-645	5-646	5-647	5-648	5-649	5-650	5-651	5-652	5-653	5-654	5-655	5-656	5-657	5-658	5-659	5-660	5-661	5-662	5-663	5-664	5-665	5-666	5-667	5-668	5-669	5-670	5-671	5-672	5-673	5-674	5-675	5-676	5-677	5-678	5-679	5-680	5-681	5-682	5-683	5-684	5-685	5-686	5-687	5-688	5-689	5-690	5-691	5-692	5-693	5-694	5-695	5-696	5-697	5-698	5-699	5-700	5-701	5-702	5-703	5-704	5-705	5-706	5-707	5-708	5-709	5-710	5-711	5-712	5-713	5-714	5-715	5-716	5-717	5-718	5-719	5-720	5-721	5-722	5-723	5-724	5-725	5-726	5-727	5-728	5-729	5-730	5-731	5-732	5-733	5-734	5-735	5-736	5-737	5-738	5-739	5-740	5-741	5-742	5-743	5-744	5-745	5-746	5-747	5-748	5-749	5-750	5-751	5-752	5-753	5-754	5-755	5-756	5-757	5-758	5-759	5-760	5-761	5-762	5-763	5-764	5-765	5-766	5-767	5-768	5-769	5-770	5-771	5-772	5-773	5-774	5-775	5-776	5-777	5-778	5-779	5-780	5-781	5-782	5-783	5-784	5-785	5-786	5-787	5-788	5-789	5-790	5-791	5-792	5-793	5-794	5-795	5-796	5-797	5-798	5-799	5-800	5-801	5-802	5-803	5-804	5-805	5-806	5-807	5-808	5-809	5-810	5-811	5-812	5-813	5-814	5-815	5-816	5-817	5-818	5-819	5-820	5-821	5-822	5-823	5-824	5-825	5-826	5-827	5-828	5-829	5-830	5-831	5-832	5-833	5-834	5-835	5-836	5-837	5-838	5-839	5-840	5-841	5-842	5-843	5-844	5-845	5-846	5-847	5-848	5-849	5-850	5-851	5-852	5-853	5-854	5-855	5-856	5-857	5-858	5-859	5-860	5-861	5-862	5-863	5-864	5-865	5-866	5-867	5-868	5-869	5-870	5-871	5-872	5-873	5-874	5-875	5-876	5-877	5-878	5-879	5-880	5-881	5-882	5-883	5-884	5-885	5-886	5-887	5-888	5-889	5-890	5-891	5-892	5-893	5-894	5-895	5-896	5-897	5-898	5-899	5-900	5-901	5-902	5-903	5-904	5-905	5-906	5-907	5-908	5-909	5-910	5-911	5-912	5-913	5-914	5-915	5-916	5-917	5-918	5-919	5-920	5-921	5-922	5-923	5-924	5-925	5-926	5-927	5-928	5-929	5-930	5-931	5-932	5-933	5-934	5-935	5-936	5-937	5-938	5-939	5-940	5-941	5-942	5-943	5-944	5-945	5-946	5-947	5-948	5-949	5-950	5-951	5-952	5-953	5-954	5-955	5-956	5-957	5-958	5-959	5-960	5-961	5-962	5-963	5-964	5-965	5-966	5-967	5-968	5-969	5-970	5-971	5-972	5-973	5-974	5-975	5-976	5-977	5-978	5-979	5-980	5-981	5-982	5-983	5-984	5-985	5-986	5-987	5-988	5-989	5-990	5-991	5-992	5-993	5-994	5-995	5-996	5-997	5-998	5-999	6-00
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AGE IN YEARS	27"	28"	29"	30"	31"	32"	33"	34"	35"	36"	37"	38"	39"	40"	41"	42"	43"	44"	45"	46"	47"	48"	49"	50"	51"	52"	53"	54"	55"	56"	57"	58"	59"	60"	61"	62"	63"	64"	65"	66"							
3	23	23	24	24	25	26	26	27	28	29	30	31	32																																		
4					26	27	28	29	30	31	32	32	33	33	34	35																															
5							29	30	31	32	33	34	34	35	36	37	38	39																													
6									31	32	33	34	34	35	36	37	38	39	41	42																											
7											33	34	35	35	36	37	38	39	41	43	44																										
8												35	36	37	38	39	40	42	44	45	46	48	50	52	54																						
9													36	37	38	39	40	42	44	45	46	48	50	52	54	56	57	59																			
10													39	40	41	43	45	46	47	49	51	53	55	57	59	61	63	65																			
11																		44	45	47	49	51	53	55	57	59	61	63	65	68	70	72															
12																		46	48	50	52	54	56	58	60	63	61	69	71	73	75	76	78														
13																					52	54	56	57	59	61	64	67	70	72	74	76	78	80	82	85											
14																						56	58	60	61	63	65	68	71	73	75	77	80	82	85	88	91										
15																								63	65	67	69	71	73	75	79	81	83	86	89	92	95	95									
16																										66	68	70	72	74	76	80	82	84	87	90	93	97	100	104	108						
17																												72	74	76	78	82	84	86	90	93	96	99	103	107	110						
18																													74	76	78	80	84	86	88	93	96	99	102	105	109	113					



TABLE OF HEIGHTS AND WEIGHTS IN LBS.  
FOR CEYLONESE AND SOUTH INDIANS.

Age	4-10	4-11	5-0	5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	6-0
20	94	96	99	101	105	108	111	114	118	121	125	130	134	139	144
21	94	97	99	102	105	108	112	115	119	122	126	130	135	140	145
22	95	98	100	103	106	109	113	116	120	123	127	131	136	141	146
23	96	98	101	104	107	110	113	117	120	124	128	132	137	142	147
24	97	99	102	105	108	111	114	117	121	125	129	133	138	143	148
25	98	100	103	106	109	112	115	118	122	126	130	134	139	144	149
26	99	101	104	107	110	113	116	119	123	127	131	135	140	144	149
27	100	102	105	108	111	114	117	120	124	128	132	136	141	145	150
28	100	103	106	109	112	115	118	121	125	129	133	137	142	146	151
29	101	104	107	110	113	116	119	122	126	130	134	138	143	147	152
30	102	105	108	111	114	117	120	123	127	131	135	139	144	148	153
31	103	105	108	111	115	117	121	124	128	132	135	140	144	149	154
32	104	106	109	112	115	118	121	125	129	133	136	141	145	150	155
33	105	107	110	113	116	119	122	126	129	133	137	141	146	151	156
34	105	108	111	113	117	120	123	127	130	134	138	142	147	152	157
35	106	108	111	114	117	120	124	127	131	135	139	143	148	153	158
36	106	109	112	114	118	121	124	128	131	135	139	143	148	153	158
37	107	109	112	115	118	121	125	128	132	136	140	144	149	154	159
38	107	110	112	115	119	122	125	128	132	136	140	144	149	154	159
39	108	110	113	116	119	122	126	129	132	137	141	145	150	155	160
40	108	110	113	116	120	123	126	129	133	137	141	145	150	155	160
41	108	111	114	116	120	123	126	130	133	137	141	146	150	155	160
42	109	111	114	117	120	123	127	130	134	138	142	146	151	156	161
43	109	111	114	117	121	124	127	130	134	138	142	146	151	156	162
44	110	112	115	118	121	124	127	131	134	138	142	147	152	157	162
45	110	112	115	118	121	124	128	131	135	139	143	147	152	157	163
46	110	112	115	118	121	125	128	131	135	139	143	147	152	157	163
47	110	113	115	118	122	125	128	132	135	139	143	148	152	158	163
48	111	113	116	119	122	125	129	132	136	139	144	148	153	158	163
49	111	113	116	119	122	125	129	132	136	140	144	148	153	158	164
50	111	114	116	119	122	126	129	132	136	140	144	148	153	158	164

( Modified from Dr. J. J. Cursetji's Tables ).



TABLE OF HEIGHTS AND WEIGHTS FOR  
WESTERN MEN AND WOMEN.

## MALES.

Height		Age 15 to 19	Age 20 to 24	Age 25 to 29	Age 30 to 34	Age 35 to 39	Age 40 to 44	Age 45 to 49	Age 50 and upward
ft.	in.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
5	0	113	119	124	127	129	132	134	135
5	1	115	121	126	129	131	134	136	137
5	2	118	124	128	131	133	136	138	139
5	3	121	127	131	134	136	139	141	142
5	4	124	131	134	137	140	142	144	145
5	5	128	135	138	141	144	146	148	149
5	6	132	139	142	145	148	150	152	153
5	7	136	142	146	149	152	154	156	157
5	8	140	146	150	154	157	159	161	162
5	9	144	150	154	158	162	164	166	167
5	10	148	154	158	163	167	169	171	172
5	11	153	158	163	168	172	175	177	178
6	0	158	163	169	174	178	181	183	184
6	1	163	168	175	180	184	187	190	191
6	2	168	173	181	186	191	194	197	198
6	3	173	178	187	192	197	201	204	205
6	4	178	183	192	198	203	208	211	212

## FEMALES

Height		Age 20 to 24	Age 25 to 29	Age 30 to 34	Age 35 to 39	Age 40 to 44	Age 45 to 49	Age 50 and upward
ft.	in.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
4	10	111	114	117	120	124	127	129
4	11	113	116	119	122	126	129	131
5	0	115	118	121	124	128	131	133
5	1	117	120	123	126	130	133	135
5	2	120	122	125	129	133	136	138
5	2	123	125	128	132	136	139	141
5	4	126	129	132	136	139	142	144
5	5	129	132	136	140	143	146	148
5	6	133	136	140	144	147	151	152
5	7	137	140	144	148	151	155	157
5	8	141	144	148	152	155	159	162
5	9	145	148	152	156	159	163	166
5	10	149	152	155	159	162	166	170
5	11	153	155	158	162	166	170	174
6	0	157	159	162	165	169	173	177

N.B.—Height and weight taken with shoes on.

## GLOSSARY.

**Actino-therapy**, a form of cure by exposure to ultra-violet rays, infra-red rays, etc.

**Afferent Nerves**, nerves are usually mixed, *i.e.*, they have both afferent and efferent fibres. The afferent fibres take sensation to the brain or spinal cord. (Latin *ad*=to; *ferre*=to take), *e.g.*, *vagus* has both afferent and efferent fibres. Its afferent fibres carry sensation from the lungs and bronchi to the medulla of the brain.

**Allergy**, it is an unusual response to an ordinary stimulus (*vide* Chapters X and XI).

**Alveoli**, air cells.

**Aortic Reflex**, when the Blood Pressure rises and the aortic wall distended this reflex decreases the pressure. The aorta is richly supplied by sensory fibres of the *vagus*, which exerts this effect through the vaso-motor centre.

**Ardha-matsyendrasana**, a Yogic asana (*vide* Chapter VIII). It is named after Matsyendra, who first showed it. (*ardha*=half); it goes to only half the stage of the full asana.

**Asana**, Yogic posture. There are 84 Yogic asanas.

**Asthmagenic area**, this is an area in the mucous membrane of the nose, which, when stimulated by histamine or pollen of grass, etc., produces a paroxysm in an asthmatic. According to the author, there is a similar area in the region of the glottis, specially marked just below the vocal cords.

**Axon reflex**, if a posterior root nerve is stimulated it produces a dilatation of the blood vessels of the skin supplied by this nerve. Since the impulse goes against the usual route it is called *antidromic*.



**Auditory tube**, or Eustachian tube; this is a narrow tube that connects the throat to the middle ear or tympanum.

**Aura**, a general loose term to denote definite subtle bodies, which interpenetrate and surround the physical body.

**Autonomic nervous system**—*vide* under Nervous System.

**Ayurveda**. The Indigenous system of Medicine is composed of—(1) *Ayurveda*, the system that first belonged to the Aryans, but now found in every part of India and Ceylon. The original works are in Sanskrit. (2) *Siddha*, principally the system of the Siddhars; the Siddhars are great Yogis among the Tamils. Therefore this is the Tamil system of medicine. The original works are in Tamil. (3) *Unani*, the system of the Muslims. The original works are in Arabic; now in Urdhu also. All these 3 systems are taught and practised in Ceylon. The word Ayurveda is largely used to include the other 2 systems also. Ayurveda had originated from 'Atharva-veda,' *i.e.*, the 4th veda of the Hindus, (ayur, life; veda, science). Ayurveda literally means the science of life. The Sinhalese, who form the major part of Ceylon's population, practise chiefly Ayurveda as their indigenous system of medicine, though they also have special prescriptions not found in India. The principles of Ayurveda and Siddha are identical; Unani is similar, but differs in certain respects. '*Virya*' (*vide* Chapter X) as a quality in all articles of food or medicine is found in all the 3 systems of medicine. Ayurveda and Siddha divide '*Virya*' into '*Shita*' and '*Ushna*.' Unani divides each of these into further sub-divisions. The '*Virya*' of all articles given in ancient '*ola*' manuscripts, is found in modern Ayurvedic pharmacological text-books; but the *virya* of recent articles of diet, *e.g.*, various artificial foods finds no place in them. No Ayurvedic physician seems to have done research in this direction; at any rate such research is not published so far.

**Bandha**, the muscles are contracted in a certain fixed position, *e.g.*, Uddiyana Bandha. There are a few more bandhas in Yoga. We have intentionally not incorporated a certain Bandha in Kumbhaka.

**Basti**, enema taken by a Yogi, without the help of an enema douche-can.

**Bhastrika**, a variety of Pranayama (*vide* Chapter III).

**Bhogar**, one of the 18 great Siddhars. His book entitled "Seven thousand (verses)" is most interesting. A great part is devoted to medicine. There are rather uncommon asanas described. He refers to a Hindu Yogi, who went to Mecca and spoke to Mohamed in his (latter's) samadhi. Bhogar had travelled extensively by air and had lived in China also for a period. He had met Vasishta, the guru of Sri Rama and he states that this great rishi broke his silence of many centuries, initiated him into certain yogic mysteries and blessed him. Therefore according to Bhogar, Vasishta is still alive as any one of us; he lives on the 12th mountain range beyond the Himalayas. In the above reference to Mohamed, he (*i.e.*, Mohamed) is buried and is in yogic samadhi. From this state he can appear to any one and talk. Two ways of doing this are possible; one is to appear in the same physical body, the other is to materialise his subtle bodies (Prana-maya-kosha, Mano-maya-kosha, Vignana-maya-kosha and Anandamaya-kosha) and appear in this temporary form. It must be remembered that the physical body of a genuine Yogi, though buried, does not perish, because the prana-maya-kosha and the other koshas do not leave the body. (Also see Chapter VIII, D.).

**Blood Pressure (B.P.)**, the pressure exerted by blood on its vessel walls; when an artery is cut the blood spurts out vertically to a certain height, denoting roughly its pressure. Systolic B.P. is the pressure when the heart contracts. Diastolic B.P. is the pressure when the heart relaxes. In a normal average adult Systolic B.P. is 120 mms. mercury, and Diastolic B.P. is 80 mms. mercury in the brachial artery.



**Brain**, the *cerebrum* is the highest part of the brain. The *medulla* (oblongata) is the lowest part of the brain. The centres of our five senses are found in the cerebrum. In the medulla are centres that control the heart and circulation, lungs and respiration, digestion, etc. As a rule the cerebral centres control the lower or medullary centres.

**Bronchial Asthma**, this is the theme of this book *vide* Chapter I.

**Broncho-constrictor impulse**, an impulse that constricts the bronchial tubes.

**Bronchus**, one of the 2 branches of the Trachea. Each further sub-divides.

**Calory**, a small calory is the amount of heat required to raise the temperature of 1 cc. (1 gramme) of water through 1°C; a big calory is 1,000 times a small calory. All references to calory in this book denote the big calory. Food, for purposes of energy requirements of the body, is measured in calories; for example 1 gramme of carbohydrate when oxidised gives about 4 calories of heat; work done by our muscles can be expressed in calories.

**Carbohydrate**, this is one of the 3 elements in the composition of food, the other two being protein and fat. It is synthesised for us by plants with the help of sunlight and we take it as fruits, vegetables, etc.; animal tissues also have it. For a hard manual worker 500 grammes of it are needed daily; for one of sedentary occupation much less is needed. Carbohydrate is stored as glycogen in our liver and muscles. Whenever there is a sudden call for energy purposes the glycogen is converted into glucose and released into the blood. It is oxidised to give energy.

**Carotid Sinus Reflex**, the carotid sinus is a dilatation of the bifurcation of the common carotid artery and is richly supplied with sensory nerves. An undue rise in pressure in the aorta or in the carotid sinus causes

a reflex dilatation of the arterioles, which immediately lowers the general arterial pressure. In Sirshasana this reflex prevents a rise in blood pressure.

**Catatonia**, a mental disease, in which the patient passes from melancholia to mania and then to dementia and physical decay.

**Central origin**, a nerve usually has sensory fibres, which carry impulses of sensation; and motor fibres which go to the muscles. The central origin is the origin of these motor fibres and is in the central nervous system, e.g., vagus central origin is in the medulla.

**Centre**, this is the name given to an area in the nervous system that controls something below it, e.g., respiratory centre in the medulla controls respiration and the working of the lungs. Similarly there is cardiac centre which controls the heart. The word centre may be also used for 'central origin,' e.g., vagus centre.

**Central end**, when a nerve is cut, the central end is that end that is nearest the central nervous system, e.g., central end of a cut vagus is the end near the medulla.

**Central Canal**, this canal runs along the central part of the spinal cord and is in direct communication with the 4th ventricle. It is filled with cerebro-spinal fluid.

**Chromatolysis**, certain changes in nerve cells, caused by fatigue.

**Colon, Spastic**, strongly contracting large intestine; may produce diarrhoea.

**Cortical Cells**, of the brain, nerve cells situated in the cortex or outer part of the brain.

**Diaphragm**, the big sheet of muscle that lies between the chest and the abdomen. It is the chief muscle of respiration.

**Efferent Fibres**, take impulses from the brain and spinal cord to muscles, glands, etc.



**Electro-cardiogram**, is the graph or curve drawn by an electro-cardiograph.

**Electro-cardiograph**, an electrical apparatus to find how the heart works.

**Electro-encephalogram**, is the graph or curve drawn by the electro-encephalograph which is a special electrical apparatus to show the working of the action currents of the nerve cells in the brain.

**Enuresis**, passing urine without control.

**Epiglottis**, the cartilage at the root of the tongue; it overhangs the glottis.

**Ethmoid**, this bone forms a part of the nasal roof. There are cavities inside it called ethmoidal air sinuses, which are in communication with the nasal cavities.

**Eustachian Tube**, see Auditory Tube.

**Exercises for General Health and Asthma**, *vide* Chapter VIII.

**Exercises special for Asthma**, see under 'S.'

**Fast**, here food is given up for a certain number of days as a measure of cure (or for religious purposes). The emotions and mind of the faster must heartily and intelligently co-operate in the fast. Otherwise it becomes starvation! In a *complete fast* no food whatever is allowed except water (and soda); in a *partial fast* only certain meals are avoided during the period of fast. Complete fasts are either long or short. Short ones lasting less than a week may be undertaken by the faster on his own; but longer fasts should be done under the supervision of a doctor; it has to be stopped on medical advice and the doctor concerned must have preferably, experience in fasting or at least a good knowledge of the literature on this subject. *Hunger* is due to the powerful contractions of the stomach during meal-hours. It passes away completely after the 3rd day of the fast.

**Fat**, this is one of the three components of food. It is stored as fat-depots in our body. At the most 70 grammes of it are needed for a day; about 40 to 55 grammes are quite sufficient (*vide* Chapter X).

**Flex**, bend.

**Flexor**, a muscle that flexes, *e.g.*, Biceps is a flexor of the elbow.

**Gangliated Sympathetic Chain**, there is a beaded chain on either side of the vertebral column. The beads are the ganglia or swellings in the chain. Nerves enter these ganglia and fresh nerves arise from them.

**Gastric**, pertaining to the stomach.

**Gland**, a secreting organ, *e.g.*, salivary gland.

**Glottis**, the space between the 2 vocal cords. The air must pass through it to enter the larynx.

**Hard Palate**, the bony part of the roof of the mouth.

**Hatha Yoga**, that system of Yoga which deals with the perfection of the physical body.

**Hatha-pradipika**, a text-book on Hatha Yoga by Svamaramasuri.

**Helio-therapy**, a form of cure with the Sun's rays. Rollier is the father of this system (Chapter VII).

**Histamine**, it is a protein, which if set free from the histidine of the cells of the body produces unusual signs and symptoms. If set free on the skin it causes an urticarial wheal; if liberated in the bronchial tubes it causes asthma. It is found in horse's dandruff. If this touches the asthmagenic area in the nose it produces hay fever and/or asthma. It is neutralised by a ferment called 'histaminase' and by adrenalin. In allergy there seems to be a congenital defect in the histaminase contents of the cells (Chapter XI).



**Hormones**, these are internal secretions from certain glands; these are poured directly into the blood, and cause profound effects, *e.g.*, adrenalin, pituitrin, etc.

**Hydrocoele**, an increased collection of serous fluid in the sac which is around the testicle.

**Hyperpiesia**, high blood pressure.

**Hypnosis**, the production of a trance-like state by suggestions. The mind of the subject has bigger powers than in the waking state and reacts in a remarkable way to the suggestions of the operator.

**Hypothalamus**, this is an important area of the brain in which are situated the (1) *Parasympathetic centre*, which is located anteriorly and includes tuber cinereum. This is concerned with heat loss. Stimulation of this centre produces cardiac slowing vasodilatation increased peristalsis of the alimentary canal, and contraction of the bladder. (2) *Sympathetic centre*, which is situated posteriorly. This is concerned with the production and conservation of heat. Stimulation of this centre produces cardiac acceleration, rise in blood pressure, dilatation of pupils and erection of hair. From the 3rd ventricle runs a recess into that part of the pituitary gland which secretes pituitrin. More of this secretion will be poured into the cerebro-spinal fluid in asanas like Sirshasana.

**Impulse**, a disturbance, electrical in character, which travels along nerves.

**Infra-red Rays**, these rays of the sun are responsible for the heating effect of the sun. Infra-red lamps are now available.

**Intercostal**, situated between two ribs.

**Intra-thoracic**, inside the thorax or chest.

**Kapalabhati**, an exercise like Bhastrika, *vide* Chapter III. It is treated as a Kriya in Yoga.

**Kidneys**, the organs concerned with the excretion (and secretion) of urine.

**Kosha**, a sheath; there are 4 other Koshas besides the physical (*vide* under Bhogar).

**Kriya**, an act in Yoga. *e.g.*, Nauli Kriya. There are six such acts to purify the nerves.

**Kumaras**, they are Sanakan, Sanaadanan, Sanatkumar and Sanandan.

**Kumbhaka**, means retention of breath at the end of inspiration or prevention of breath at the end of expiration.

**Kundalini**, the spiritual energy which lies dormant in the lowest abdominal autonomic plexus, called Muladhara.

**Larynx**, that part of the respiratory tube that lies below the epiglottis.

**Lateral**, situated on the left or right side.

**Liver**, a very big organ situated just below the diaphragm. It is the biggest laboratory of the body, where chemical changes (metabolism) take place of the food we eat. Bile is secreted by it.

**Lungs**, the 2 organs of respiration.

**Madam**, a spiritual or Yogic centre.

**Matsyasana**, a form of asana (*vide* Chapter VIII).

**Medulla**, *vide* under Brain.

**Metabolism**, the totality of changes that the food and the tissues undergo inside the body. It is divisible into (1) *Katabolism*, *i.e.*, destructive metabolism or changes involved in the oxidation of the food and/or tissues and (2) *anabolism*, *i.e.*, constructive metabolism or changes involved in the formation of tissues from the foodstuffs. Metabolism is *exogenous* when it pertains to food and *endogenous* when it pertains to tissues of the body.



**Motor Nerves**, nerves that stimulate muscles to contract.

**Mucous Membrane**, a membranous layer of cells that secrete a viscid fluid called mucus, *e.g.*, mucous membrane of nose or bronchial tubes.

**Muscle**, a fleshy bundle attached to bones, by means of which movements are made possible. There are two varieties—(1) voluntary, *i.e.*, muscles like the biceps over which we have full control. They work only at our bidding; (2) involuntary, *i.e.*, muscles which work without our conscious knowledge, *e.g.*, muscles of the bronchi or stomach. They are said not to be under our control.

**Naso-pharynx**, that portion of the pharynx just behind the nose and just above the soft palate.

**Natham**, *vide* 'Pranava.'

**Nauli**, an abdominal exercise where the two recti-muscles are rolled about to massage the organs inside. This is treated in Yoga as a kriya (act).

**Nerves**, fine thread-like structures which connect the brain and the spinal cord to muscles, glands, skin, bones, joints and all organs of the body. They carry messages from or to the brain and spinal cord. They have usually both afferent and efferent fibres.

**Nervous System**, it is composed of—(1) *the central nervous system* consisting of the brain, spinal cord and its nerves. All our voluntary actions are done by this, (2) *autonomic nervous system* which in turn is divisible into (a) *sympathetic nervous system*, composed of two gangliated chains on either side of the vertebral column, and their branches. Our sympathies and feelings are expressed through this; (b) *parasympathetic*, composed of certain cranial nerves, *e.g.*, vagus, certain thoracic and sacral nerves. This system is anabolic in character while the sympathetic is katabolic.

**Nostrils**, the 2 openings in the nose.

**Oesophagus**, the tube from the pharynx to the stomach, through which food goes.

**Olfactory nerves**, nerves of smell.

**Optic nerves**, nerves of vision. The image in the retina of the eye causes a disturbance (electrical, chemical and mechanical) which is carried by the optic nerve and later by the optic tract and optic radiation to the visual area in the occipital lobe of the cerebrum. If the visual area or the optic nerve is damaged, vision also disappears.

**Padmasan** (or **Padmasana**), a yogic posture. *Vide* Chapter VIII under Matsyasana.

**Pancreas**, the organ that secretes pancreatic juice, a digestive juice, and *insulin* which is necessary for the assimilation of glucose by the body. Insulin is a ductless secretion.

**Parasympathetic**, *vide* nervous system.

**Parietal**, belonging to the wall, *e.g.*, Parietal layer of pleura is the layer which lines the wall of the thoracic cavity.

**Patanjali**, the author of "Yoga Sutras" named after him.

**Pelvis**, the lowest part of the abdomen. The bladder, rectum, uterus, ovaries and prostate are located in the pelvis.

**Perineum**, the part between the genitals and the anus.

**Pharynx**, the cavity that lies behind the nose, mouth and larynx stretching as far down as the level of the 6th cervical vertebra. This cavity is common passage for both food and air up to a certain limit; but it is principally a passage for food; it continues as the oesophagus below the level of the 6th cervical vertebra.

**Physiology**, the science that deals with the normal functions of the body and its organs.

**Pituitary**, a ductless gland situated inside the skull, just behind and above the sphenoidal air sinus.



**Pleura**, a serous membrane forming a blind sac around each lung.

**Pleural cavity**, the cavity between the two layers of pleurae.

**Plexus**, a network of nerves, *e.g.*, Solar Plexus is formed by the branches of the sympathetic and the vagus. This word is used with reference to blood vessels also.

**Pneumo-gastric nerve**, another name for *vagus*. It literally means the nerve for the lungs and stomach. The vagus belongs to the parasympathetic and proceeds from the medulla to the heart, lungs, stomach, intestine, pancreas, etc. It takes part in the formation of many plexuses, *e.g.*, pulmonary plexus, solar plexus, etc. It supplies also the bronchial muscles. Stimulation of it causes asthma. It has a few nuclei of origin in the medulla. One of it is the nucleus ambiguus. The broncho-motor portion of the vagus nucleus is that part of its motor nucleus that supplies the bronchial muscles. This nucleus is irritable in asthma, and sends out impulses causing spasms of the bronchi.

**Pneumo-taxic centre**, a centre situated in the Pons, which inhibits respiration.

**Posterior**, pertaining to the back side.

**Prana**, breath, primordial energy; it is the stuff of Pranamaya-kosha. Prana flows along nerves. A portion of a nerve can be made analgesic (*i.e.*, insensitive to pain) by taking away the prana over that portion by so-called magnetic passes (*c.f.*, hysterical analgesia).

**Pranava**, this is the first sound in creation. It is symbolised by the sound "Om." It is also known as "Natham." It is this sound, proceeding from the *sakti* or energy-aspect of God that creates. By Yoga practices one can hear this 'natham.' This sound belongs to a plane higher than any we normally know; that is, it is beyond the physical plane, beyond our emotional plane, nay beyond the mental plane.

It is heard by the soul as a sound, and the sound proceeds from God. Therefore 'natham' belongs almost to the plane of the soul, in its manifested aspect. It is not an imaginary sound, by any means. It is a sound which one can hear. In special places where God's Grace is manifested in abundance, *e.g.*, Thiruketeeshwaram (near Mannar) it is heard remarkably loudly and it can be heard over a radius of many miles from that spiritual centre. An ancient saint compared the intensity of the natham at this shrine to the roar of the billows. It is also loudly heard when a jivan-mukthan, *i.e.*, one who is united to the feet of God, is in the near vicinity; in this case also it is heard over a radius of many miles. When His Holiness Swamy Sivananda recently visited Colombo (for the first time after His God-realisation), this phenomenon was very noticeable and forcibly attracted the author's attention. It was heard with great intensity even when he was a few hundred miles away from Colombo. This 'pranava' resembles the sound 'Om.' Therefore in Appendix I. great importance is given to the mental chanting of 'Om.' It is interesting to know that the gigantic Hindu Temple at Thiruketeeshwaram, which was in great prominence during the times of the Roman Emperors, was brought down by the Portuguese, when they conquered Ceylon; and its massive stones were utilised to build the 'fort' at Mannar.

**Pranayama**, yogic breath control. The varieties referred to in this book are Ujjayi and Bhastrika. Kumbhaka is an integral part of pranayama. The author has also given his own pranayama (*vide* Chapter V).

**Proteins**, an important constituent of food. It is of special importance in the formation of new tissues, to make good wear and tear. About 40 to 50 grammes of it are needed daily. Animal protein (either as milk, cheese or meat, etc.) should form part of the total protein intake. Chittenden holds that this amount is enough for the body.



✓ **Psychiatrist**, a healer of mental diseases.

**Psychosis**, mental affection or affliction.

**Pulmonary**, pertaining to the lungs.

**Raja Yoga**, that Yoga that deals with the control of the mind reaching up to nirvikalpa samadhi or union with God.

**Rectum**, the last part of the bowel, from which the faeces are expelled.

**Residual Air**, that air that is left in the lungs even after the most forcible exhalation.

**Respiration**, breathing.

**Respiratory Centres**, these centres are in the medulla. These automatically work causing inspiration and expiration in a regular sequence till death. There are two respiratory centres, left and right, and each is divided into an *inspiratory centre* and an *expiratory centre*. These are closely connected with the vagus centres, and with the higher centres in the Pons (pneumotaxic centres) and in the cerebrum.

**Sacrum**, a set of 5 vertebrae united together and forming part of the posterior wall of the Pelvis.

**Samadhi**, a state of union with God or a burial of a Saint in this state when the pulse has stopped.

**Secretion**, a juice secreted by a glandular structure, *e.g.*, phlegm is secreted by the mucous membrane of the nose, bronchi, etc. When the secretion is poured into the blood directly it is called *internal secretion*, *e.g.*, insulin of the pancreas, or thyroid secretion.

**Sensory Nerves**, same as afferent nerves.

**Septum**, a separating wall, *e.g.*, nasal septum separates the 2 nasal cavities.

**Serous Membrane**, a smooth membrane that secretes a serous fluid.

**Sarvangasana**, an important asana (*vide* Chapter VIII).

**Siddhis**, great powers obtained by Yoga (*vide* Chapter X).

**Sirshasana**, a very important asana, a king among asanas (*vide* Chapter VIII).

**Soft Palate**, the fleshy part of the roof of the mouth.

**Special Asthma Exercises**, Ujjayi, Bhastrika, Uddiyana and author's (*vide* Chapters II-V).

**Specific Dynamic Action**, when protein that ought to give 100 calories of heat is ingested it produces 130 calories of heat in our body. This is said to be due to specific dynamic action. It is discussed in Chapter X under Section—"Prana-maya-kosha."

**Spinal Column**, spine, backbone. It is formed by the vertebrae.

**Spinal Cord**, this is a white nervous structure situated in the vertebral or neural canal of the spine; it is connected directly with the medulla of the brain.

**Spinal Nerves**, these are nerves connected to the spinal cord.

**Sternum**, breast bone.

**Stimulus**, it may be electrical, chemical, mechanical or thermal; it causes a functional reaction, *e.g.*, electrical stimulus to vagus centre or nerve causes the bronchi to contract spasmodically.

**Sutra**, aphorism.

**Svatmarama Suri**, the author of Hatha-Pradipikā, an authoritative text-book on Hatha Yoga.

**Sympathetic**, *vide* nervous system.

**Therapeutics**, science of healing.

**Third Ventricle**, this cavity is situated between the 2 cerebral hemispheres and is filled with cerebro-spinal



fluid, which communicates with the lateral ventricles on either side, and with the 4th ventricle through the aqueduct of Sylvius. Its floor is occupied by important hypothalamic nuclei which form the head centres of the sympathetic and parasympathetic nervous systems (*vide* Hypothalamus).

**Thirumoolanayanar**, one of the greatest of the world's Yogis. He is a Tamil Yogi, one of the 18 siddhars. According to his life's story he is said to have flown from the Himalayas to South India. Here, one day, he saw a shepherd, just dead, and the sheep all crowding round the dead body in great grief. Out of compassion for the sheep this Yogi left his physical body, and his soul entered the dead body and gave it life; and ever afterwards he was known as Thiru-moolan; Moolan was the name of the shepherd and 'Thiru' denotes 'deifying,' i.e., deified moolan. Nayanar is a suffix given to a selected number (64) of Tamil saints. He is the author of "Thirumanthiram" a yogic work, which is not yet fully interpreted, and the medical work "Gunavakadam." (c.f., Buddha's compassion under similar circumstances).

**Thorax**, chest.

**Thyroid**, a ductless gland in the lower part of the neck; if deficient it causes dwarfism or cretinism, i.e., prevents growth. If increased it causes all the symptoms of goitre. Normally this gland is not visible, but in goitre it is prominently visible.

**Tone**, this is the slight tension or contraction in a muscle. It denotes well-being, when used in a general sense.

**Toxins**, analogous to poisons.

**Trachea**, the windpipe from the termination of the larynx to the bifurcation in the chest into the 2 bronchi.

**Ujjayi**, a variety of Pranayama, wherein the vocal cords are approximated (*vide* Chapter II).

**Ultra-violet Rays**, these form the main section of the sun's rays that we use in the cure of asthma and skin diseases. There are various ultra-violet lamps now available. Some are intended for general exposure of the entire body, others only for smaller areas.

**Vagus Nerve**, see Pneumogastric nerve. (Lat. vagus = wandering); also called 10th cranial nerve.

**Ventricle**, a cavity in the heart; there are 2 ventricles. It also means cavity in the brain; there are 4 such cavities, which are filled with cerebro-spinal fluid.

**Vertebra**, there are 33 vertebrae forming the vertebral column, of which 7 are cervical (neck), 12 dorsal (thoracic), 5 lumbar, 5 sacral and 4 coccygeal (*vide* Plate I). Through the vertebral canal the spinal cord runs. The vertebrae are moved by certain muscles. They take up varying portions of our weight in our erect position. When we sleep in distorted positions we assume wrong positions and on getting up we complain of pain (e.g., wry neck) or a catch. The vertebrae that have got into wrong position should be put back. Heavy weights, before attempting *Sirshasana*, must test if the vertebrae especially cervical and dorsal and the back muscles are sufficiently developed to withstand the weight of the body. It is otherwise dangerous to attempt this asana.

**Viparitha Karani**, an asana (*vide* under Sarvangasana, Chapter VIII).

**Virya**, *vide* under Ayurveda.

**Viscera**, organ, e.g., liver inside the abdomen.

**Visceral Layer**, that layer (e.g., of pleura) which is next to a viscera (here lung).

**Vital Capacity**, the largest volume of air one can breathe out after the largest possible inhalation (*vide* Chapters II & XI).

**Vitamins**, these are important accessory food factors. There are vitamins A, B, C, D, E, K, P, etc. A small



quantity of each is needed for our daily requirements any deficiency causes an illness. Fresh vegetables and fruits are rich in them.

**Vocal cords**, the 2 folds in the larynx which are responsible for the production of voice (*vide* Chapter II).

**Wimshurst Machine**, an electrical apparatus for generating a current of very high voltage (over 50,000 volts).

**Work**, the work of a muscle, *e.g.*, heart-muscle, is measured in gramme-metres. It can be converted into and expressed in calories, *e.g.*, heart energy output at rest is 240 calories per day.

**Yoga**, a system composed of Hatha Yoga and Raja Yoga. The former deals chiefly with the body and the latter chiefly with the control of the mind. The final aim is union with God; just before Union there is the appearance of God (Savikalpa Samadhi). Then follows Nirvikalpa-Samadhi, where the devotee is united to the feet of God. In this book we are chiefly concerned with Hatha Yoga.

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